



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Annual Review

2016— 2017

DR PATRICK PRENDERGAST
PROVOST & PRESIDENT



Contents

01	01.0	Introduction from the Provost	02
02	02.0	Trinity at a Glance	06
03	03.0	Trinity's Global Engagement	14
04	04.0	Research Case Studies	18
	04.1	Aileen Douglas	20
	04.2	Anna Davies	22
	04.3	Brian Lucey	24
	04.4	Brian Singleton	26
	04.5	Christine Casey	28
	04.6	Fabio Boylan	30
	04.7	Fáinche Ryan	32
	04.8	Michael Shevlin	34
	04.9	Tim Persoons	36
	04.10	Fiona Newell	38
	04.11	John V Reynolds	40
	04.12	Siobhán Clarke	42
05	05.0	Trinity joins the League of European Research Universities	44
06	06.0	Innovation and Enterprise	48
07	07.0	Public Engagement	52
08	08.0	The Student Experience	58
09	09.0	Opening Access to Education	62
10	10.0	Developing the Campus	66
11	11.0	Trinity Sport—Raising our Game	70
12	12.0	New Professor Interviews	74
	12.1	Professor Aljosa Smolic	76
	12.2	Professor Eiléan Ní Chuilleanáin	79
	12.3	Professor Rhodri Cusack	82
13	13.0	Provost's Council	86
14	14.0	Trinity's Visitors	90
15	15.0	Governance	94
16	16.0	Financial Elements	98

Introduction from the Provost

This year, 2017, was the 425th anniversary of the University since our founding by charter from Elizabeth the First in 1592. To commemorate we brought out a book, *Trinity 425*, of photos of the campus taken by students, staff and graduates, and we held a 425 Symposium in September. Six historians gave addresses, looking at key historical periods, and I myself gave the final address on Trinity in its fifth century - which began in 1992 and will end in 2092.

It was a great event, opened by An Taoiseach, Leo Varadkar, T.D. The significance was lost on no one that, in this historic 425th year, we have, for the first time ever, a Trinity graduate as Taoiseach. In other respects too, 2017 was a good year of achievement and consolidation.

It began excellently in January with our becoming a member of LERU, the League of European Research Universities, a powerful EU research and education policy group of Europe's top 20 universities. We explain what membership will mean for Trinity and Ireland in **Chapter 5, Trinity joins LERU.**

Trinity was accepted to LERU thanks to our success in education, research and innovation, and we received further endorsement of this during the year – in September we learnt that we have gone up in all the major rankings, the beginning of the reversal of the decline that set in in 2009, and that for the third year running, private equity and venture-focused research firm, Pitchbook has rated us Europe's Number 1 university for educating entrepreneurs. In **Chapter**

6, Innovation and Enterprise, we look at some of the great innovation being carried out by staff and students on campus.

And this academic year, 2016-17, the first cohort of students completed their Foundation Year in Lady Margaret Hall (LMH) in Oxford as a result of a partnership between LMH and Trinity, with LMH adapting the Trinity Access Programme (TAP) Foundation Course to the context of Oxford University. The Trinity Access Programmes are about combatting inequality of educational opportunity, and Trinity is proud to be spearheading access in the wider international environment – we are also partnering with the NGO, College for Every Student, in the US. In **Chapter 9, Opening Access to Education**, we talk about these initiatives.

Work is underway on the new €80 million Trinity Business School, designed by Scott Tallon Walker architects, which will be completed end 2018. The Printing House Square project, on the former Oisín House site, comprising 250 new student bedrooms along with a new health unit, disability services and sports facilities has been designed by McCullough Mulvin architects, with project completion envisaged for August 2019. You can read about these and our other key capital development projects in **Chapter 10, Developing the Campus.**

Education, Research and Public Engagement are at the heart of everything we do. That's education in its broader sense – what happens inside and outside the lecture room and library. In **Chapter 8, The Student Experience** and



→ It began excellently in January with our becoming a member of LERU, the League of European Research Universities, a powerful EU research and education policy group of Europe's top 20 universities...



Chapter 11, Trinity Sport – Raising Our Game, we focus on the huge range of extracurricular activities on campus, and the opportunities they give our students to develop skills like leadership, team work, volunteering, public speaking, fund raising and personal exploration.

We interview three new professors – in Creative Technologies, Cognitive Neuroscience, and Poetry – and hear about their exciting research. And in **Chapter 4, Research Case Studies**, 12 of our researchers across our three faculties detail some of their research projects – from the sustainability potential of ICT-mediated urban food-sharing, to the recovery, representation and analysis of marginalized identities in theatre and performance; from ‘ethnopharmacology’, the use of natural or traditional medicines, to the phenomenon of ‘post-truth’ (where objective facts are less influential in shaping public opinion than appeals to emotion and personal belief).

As in previous years, public lectures, symposia and talks, and exhibitions, films and performances were some of the key ways in which Trinity delivered on our commitment to ‘engage wider society’. We talk about some of these in **Chapter 7, Public Engagement**. Some of my favourites events, from a

very competitive field, include the Trinity Creative Challenge, now in its second year, and ‘the Reformation at 500’, an initiative of our Confederal School of Religions, Peace Studies and Theology together with the Lutheran Church in Ireland, to mark the quincentenary of the Reformation – it included a symposium and a travelling exhibition, the ‘Reformation Roadshow’, an initiative of the German government and Lutheran Church which visited 67 places in nineteen European countries.

And not forgetting the great programme of events marking the 50th anniversary of the Berkeley Library. It’s hard for many of us to believe the Berkeley – always the enfant terrible among Trinity buildings – is fifty. It looks as fresh and iconic as when it was built in 1967 following a fundraising drive, and is a reminder to us all to be daring, resolute and adventurous, not just in our buildings, but in all our initiatives.

My thanks to the whole community – staff, students and alumni – for another wonderful Trinity year.

Dr Patrick Prendergast
Provost & President

ABOVE – Among the contributors and representatives of areas included in this Provost’s Review are, standing (L-R) Tom Molloy, Director of Public Affairs and Communications; Michelle Tanner, Head of Sport & Recreation; Prof Kevin O’Kelly, Dean of Students; Ian Mathews, Chief Financial Officer; Sally-Anne Fisher, Head of Communications; Cliona Hannon, Director, Trinity Access Programmes; Prof Veronica Campbell, Bursar & Director of Strategic Innovation; Doris Alexander, Research Development Manager; John Coman, Secretary to the College; seated (L-R) Prof Juliette Hussey, Vice-President for Global Relations; Dr Patrick Prendergast, Provost; Prof Chris Morash, Vice-Provost / Chief Academic Officer; and Prof Paula Murphy, Registrar

BELOW TOP – Recipients of the 2017 Provost's Teaching Awards, from left, Dr Marie Morris, School of Medicine, Prof Mairead Brady, School of Business, Prof Michael King, School of Social Sciences and Philosophy, Prof Susan O'Callaghan, School of Medicine and Prof Anita O'Donovan, School of Medicine

BELOW BOTTOM – An Taoiseach, Leo Varadkar, T.D. with the Provost at the Trinity 425 Symposium



→ Some of my favourites events, from a very competitive field, include the Trinity Creative Challenge, now in its second year, and ‘the Reformation at 500’...



Trinity at a Glance

Trinity is Ireland's
No. 1 University

QS World University Ranking, THE World
University Ranking, Academic Ranking
of World Universities (Shanghai)



→ A 425 year old
university in the heart
of Dublin city centre

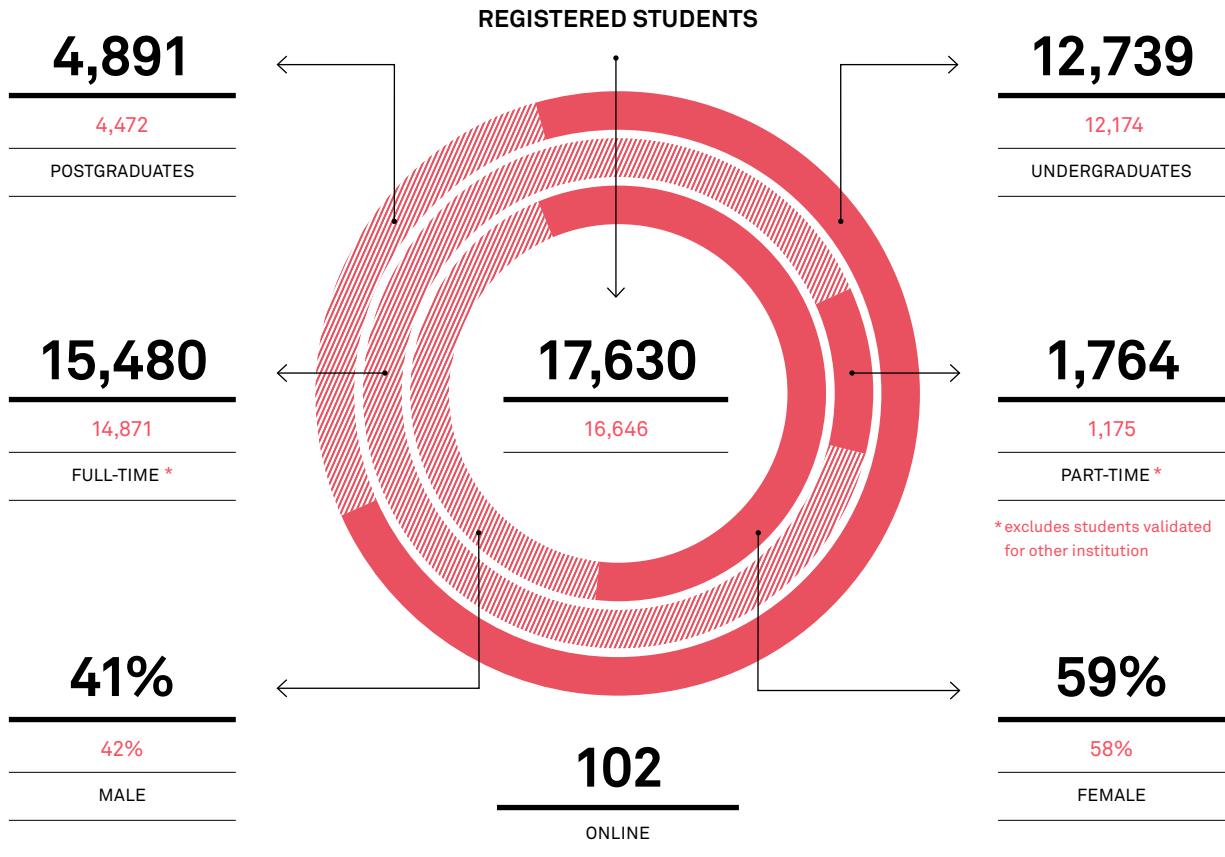
02

Student Statistics

2017 | 2013

(5 year comparison)

Our student body has increased
by 6% in the past 5 years



ALUMNI

2017 | 2013

115,443 | 100,277

REPUBLIC OF IRELAND	85,497	74,170
GREAT BRITAIN	10,600	9,616
NORTHERN IRELAND	4,672	4,621
USA	4,209	3,557
CANADA	1,600	1,162
REST OF WORLD	8,865	7,151

CLUBS AND SOCIETIES

48 | 49

SPORTS CLUBS

121 | 112

STUDENT SOCIETIES

THE LARGEST SOCIETIES ARE:

THE VINCENT DE PAUL SOCIETY

THE PHILOSOPHICAL SOCIETY (THE PHIL)

DU PLAYERS

THE COLLEGE HISTORICAL SOCIETY (THE HIST)

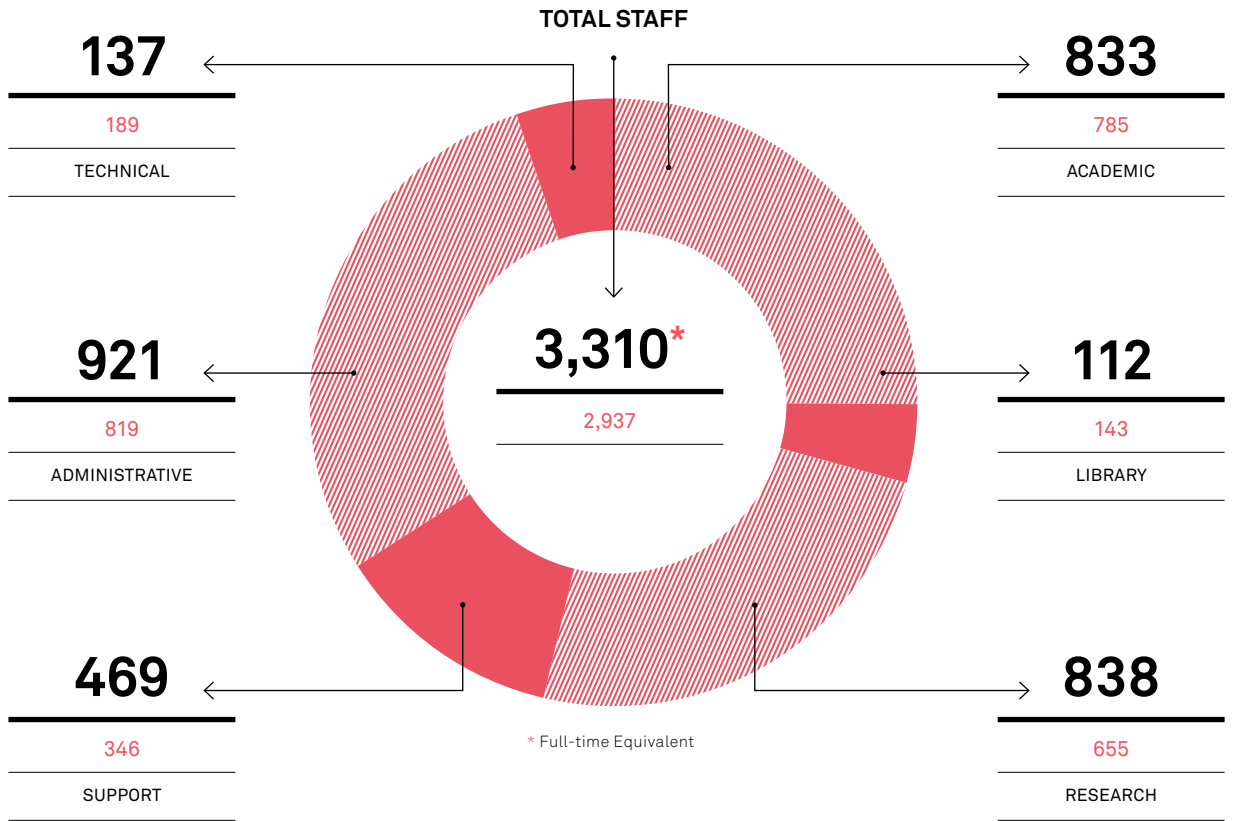
— The college historical society (the hist) is the oldest student society in the world, founded in 1770

Staff Statistics

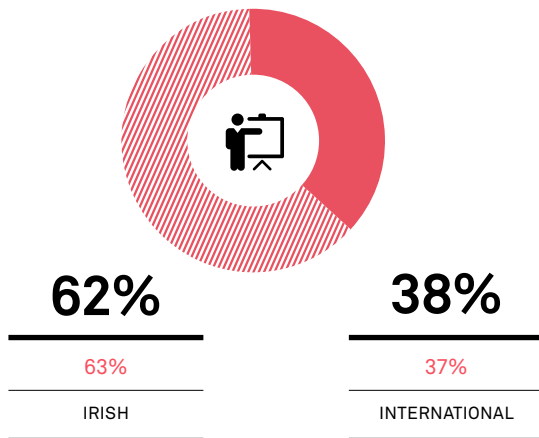
2017 | 2013

(5 year comparisons)

Our staff body has increased by 13% over the past 5 years

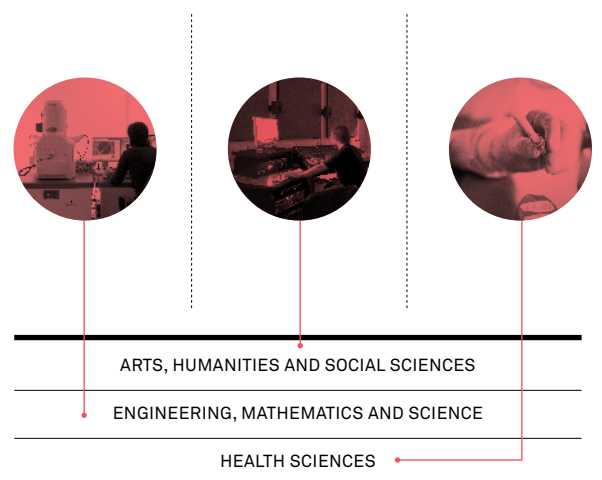


ACADEMIC STAFF*



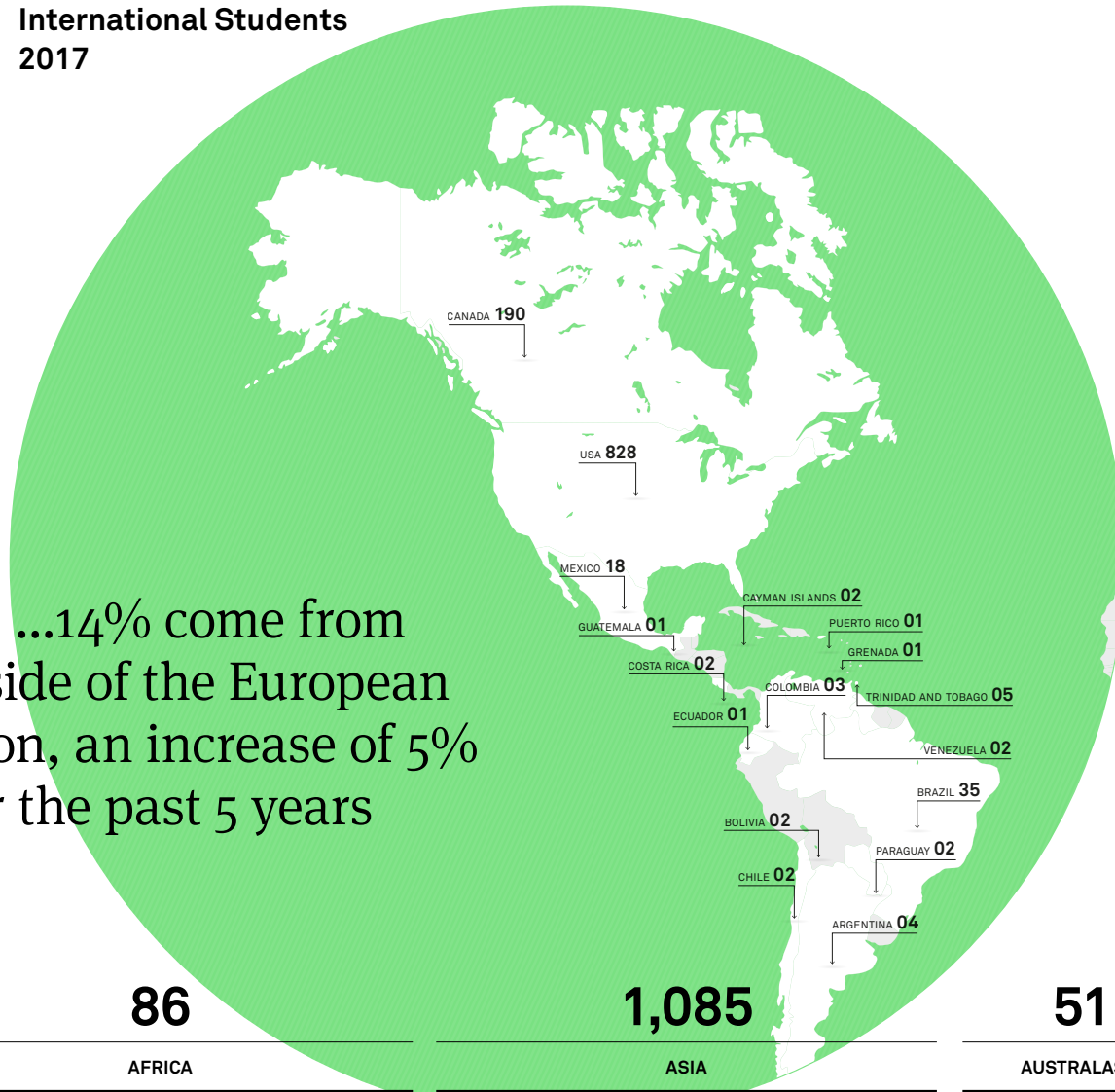
* Headcount

FACULTIES



02 International Students 2017

→ ...14% come from outside of the European Union, an increase of 5% over the past 5 years



86

AFRICA

BURUNDI	1	MAURITIUS	7
CAMEROON	1	MOROCCO	2
CONGO	3	NIGERIA	14
EGYPT	8	SOMALIA	1
GHANA	3	SOUTH AFRICA	19
GUINEA	1	SUDAN	3
KENYA	5	TOGO	1
LIBERIA	2	ZAMBIA	1
LIBYA	9	ZIMBABWE	4
MALAWI	1	TOTAL	86

1,085

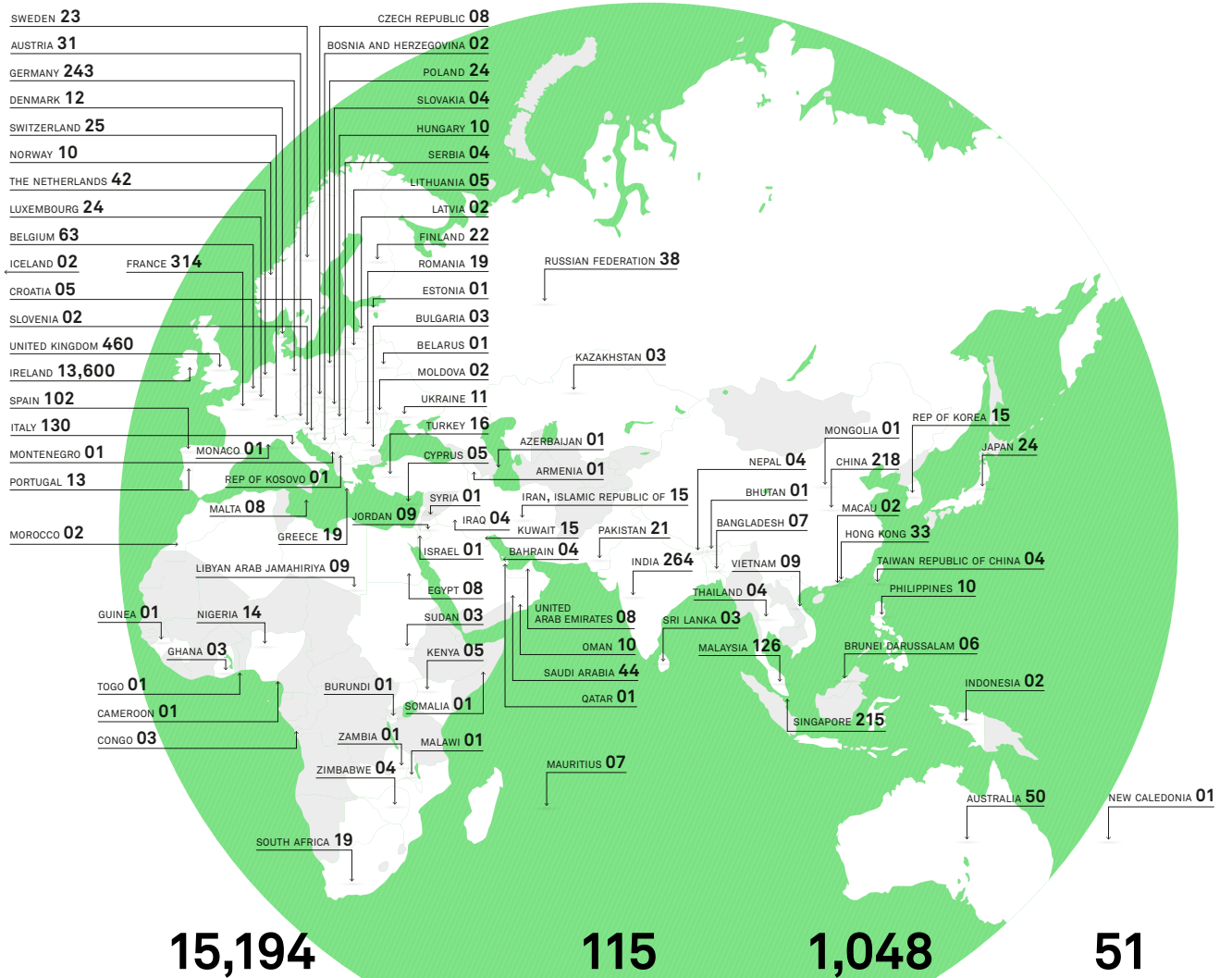
ASIA

AZERBAIJAN	1	MALAYSIA	126
BAHRAIN	4	MONGOLIA	1
BANGLADESH	7	NEPAL	4
BHUTAN	1	OMAN	10
BRUNEI DARUSSALAM	6	PAKISTAN	21
CHINA	218	PHILIPPINES	10
HONG KONG	33	QATAR	1
INDIA	264	REP OF KOREA	15
INDONESIA	2	SAUDI ARABIA	44
ISLAMIC REP OF IRAN	15	SINGAPORE	215
IRAQ	4	SRI LANKA	3
ISRAEL	1	SYRIAN ARAB REPUBLIC	1
JAPAN	24	TAIWAN REP OF CHINA	4
JORDAN	9	THAILAND	4
KAZAKHSTAN	3	UNITED ARAB EMIRATES	8
KUWAIT	15	VIETNAM	9
MACAU	2	TOTAL	1085

51

AUSTRALASIA

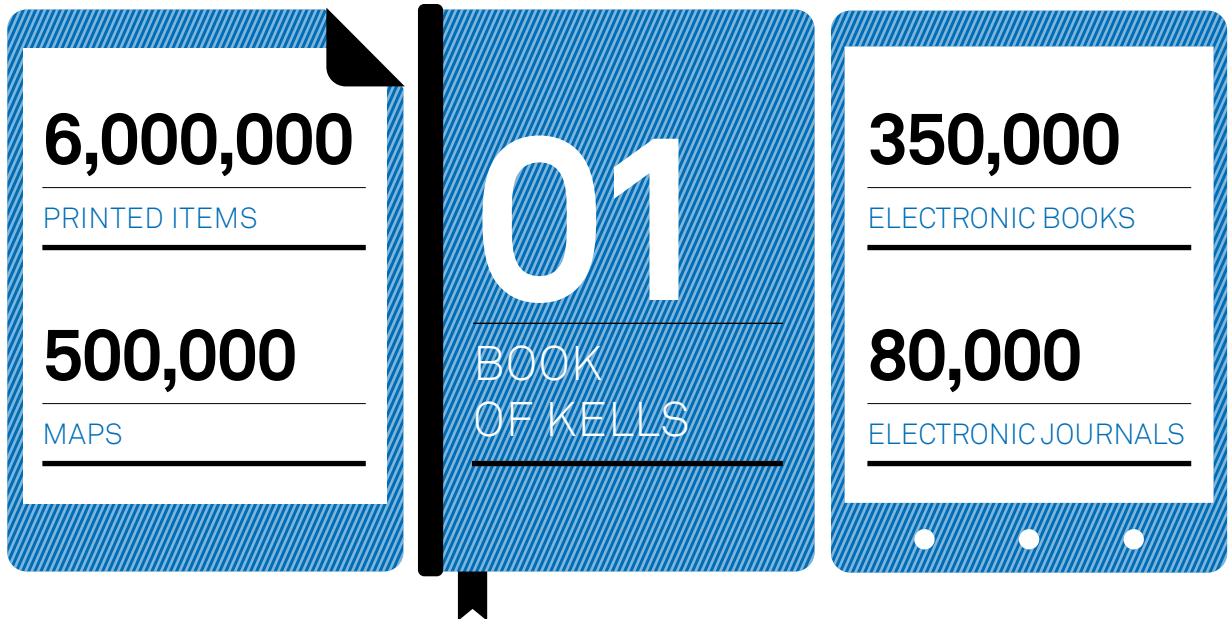
AUSTRALIA	50
NEW CALEDONIA	1
TOTAL	51



EUROPE EU		EUROPE NON EU		NORTH/CENTRAL AMERICA		SOUTH AMERICA	
AUSTRIA	31	ARMENIA	1	CANADA	190	ARGENTINIA	4
BELGIUM	63	BELARUS	1	CAYMAN ISLANDS	2	BOLIVIA	2
BULGARIA	3	BOSNIA & HERZEGOVINA	2	COSTA RICA	2	BRAZIL	35
CROATIA	5	ICELAND	2	GRENADA	1	CHILE	2
CYPRUS	5	MOLDOVA	2	GUATEMALA	1	COLOMBIA	3
CZECH REPUBLIC	8	MONACO	1	MEXICO	18	ECUADOR	1
DENMARK	12	MOTENEGRO	1	PUERTO RICO	1	PARAGUAY	2
ESTONIA	1	NORWAY	10	TRINIDAD & TOBAGO	5	VENEZUELA	2
FINLAND	22	REPUBLIC OF KOSOVO	1	USA	828	TOTAL	51
FRANCE	314	RUSSIAN FEDERATION	38	TOTAL	1048		
GERMANY	243	SERBIA	4				
GREAT BRITAIN	460	SWITZERLAND	25				
GREECE	19	TURKEY	16				
HUNGARY	10	UKRAINE	11				
		TOTAL	115				
IRELAND	13,600						
ITALY	130						
LATVIA	2						
LITHUANIA	5						
LUXEMBOURG	24						
MALTA	8						
POLAND	24						
PORTUGAL	13						
ROMANIA	19						
SLOVAKIA	4						
SLOVENIA	2						
SPAIN	102						
SWEDEN	23						
THE NETHERLANDS	42						
TOTAL	15,194						

02 Library

LIBRARY COLLECTION HAS



TRINITY'S RESEARCH THEMES

- | | | |
|--------------------------|--|-------------------------------------|
| — AGEING | — IDENTITIES IN TRANSFORMATION | — MANUSCRIPT, BOOK & PRINT CULTURES |
| — CANCER | — IMMUNOLOGY, INFLAMMATION & INFECTION | — NANOSCIENCE |
| — CREATIVE ARTS PRACTICE | — INCLUSIVE SOCIETY | — NEUROSCIENCE |
| — CREATIVE TECHNOLOGIES | — INTERNATIONAL DEVELOPMENT | — NEXT GENERATION MEDICAL DEVICES |
| — DIGITAL ENGAGEMENT | — INTERNATIONAL INTEGRATION | — SMART AND SUSTAINABLE PLANET |
| — DIGITAL HUMANITIES | — MAKING IRELAND | — TELECOMMUNICATIONS |
| — GENES AND SOCIETY | | |

LEADING FLAGSHIP RESEARCH INSTITUTES

05

- TRINITY BIOMEDICAL SCIENCES INSTITUTE
- CENTRE FOR RESEARCH ON ADAPTIVE NANOSTRUCTURES AND NANODEVICES (CRANN)
- TRINITY COLLEGE INSTITUTE OF NEUROSCIENCE (NATIONAL NEUROSCIENCE NETWORK)
- TRINITY LONG ROOM HUB, ARTS AND HUMANITIES RESEARCH INSTITUTE
- TRINITY TRANSLATIONAL MEDICINE INSTITUTE

Commercialisation of Research

2017 | 2014

(4 year comparisons)

IN THE PERIOD 2012–2017
(2009–2014)

329 | 308

DISCLOSURES OF NOVEL INVENTIONS

126 | 81

LICENCES TO INDUSTRY GRANTED

22 | 37

TRINITY CAMPUS
COMPANIES APPROVED

IN THE YEAR ENDED SEPTEMBER 2017
(2014)

02 | 04

TRINITY CAMPUS COMPANIES

61 | 58

DISCLOSURES OF NOVEL INTELLECTUAL
PROPERTY RECEIVED

13 | 28

COMMERCIALISATION LICENCES
TO INDUSTRY

18 | 23

NEW PATENT APPLICATIONS FILED

27 | 32

COLLABORATIVE RESEARCH
AGREEMENTS WITH INDUSTRY EACH <€25K

61 | 51

COLLABORATIVE RESEARCH
AGREEMENTS WITH INDUSTRY EACH >€25K

CONSOLIDATED FINANCIAL STATEMENTS

€339.0M

TOTAL INCOME FOR
YEAR ENDED 2016
(EXCLUDING GRANT
AMORTISATION)

€323.0M

TOTAL INCOME FOR
YEAR ENDED 2015
(EXCLUDING GRANT
AMORTISATION)

€305.7M

TOTAL INCOME FOR
YEAR ENDED 2014
(EXCLUDING GRANT
AMORTISATION)

€302.3M

TOTAL INCOME FOR
YEAR ENDED 2013
(EXCLUDING GRANT
AMORTISATION)

€304.5M

TOTAL INCOME FOR
YEAR ENDED 2012
(EXCLUDING GRANT
AMORTISATION)

FINANCIAL YEAR	€m 2012	€m 2016
STATE GRANTS	€58.70	€44.00
ACADEMIC FEES	€113.80	€133.70
RESEARCH GRANTS AND CONTRACTS	€75.90	€92.20
COMMERCIAL REVENUE UNIT INCOME	€27.10	€40.60
OTHER INCOME	€22.40	€10.00
ENDOWMENT AND INVESTMENT INCOME	€6.60	€18.50
INCOME (EXCLUDING GRANT AMORTISATION)	€304.50	€339

Trinity's Global Engagement

This year's Global Engagement Awards showcased the range, strength and diversity of Trinity's initiatives in this area. Professional and academic staff were awarded for:

- the successful positioning of Trinity to join the prestigious League of European Research Universities, LERU [Doris Alexander & Jennifer Taaffe];
- Furthering the unique partnership with Thapar University in India [Prof Brian Foley];
- Piloting the Trinity Access Programme to Lady Margaret Hall College in Oxford University, and developing the relationship with the NGO, College for Every Student, in the United States [Cliona Hannon];
- Expanding the Singapore-based programmes in health sciences, including designing a joint degree in Physiotherapy between Trinity and Singapore Institute of Technology [Prof John Gormley];
- Establishing the Global Brain Health Institute, a joint initiative with the University of California San Francisco and funded by the largest philanthropic donation in Irish history from the Atlantic Philanthropies [Prof Ian Robertson];
- Developing the MSc in International Management and embedding internationalism into Trinity's educational and research culture in the School of Business [Prof Mary Keating].

Collectively these initiatives, each remarkable in itself, demonstrate the full scope of Trinity's global engagement, which is a horizontal strategy, going across the University and its mission in education, research, innovation and public engagement, and driven by both professional and academic staff.


A Diverse and Global Student Body

In 2016/17, the student body included over 4,774 students from outside of Ireland, with 2,135 of these coming from outside of the European Union, representing 27% and 14% respectively of the total student body.

Building up the number of students from around the world has been made possible by sustained efforts by the Global Relations team who have been supported by alumni globally. Recruitment activity in the last year focused on US and Canada, China, Hong Kong, Taiwan, India, Vietnam, Thailand, Malaysia, Singapore, Russia, Kazakhstan, Nigeria and the Middle East. The recruitment activity in the US included five 'Trinity in US' open days (Boston, New York, Philadelphia, Washington, Chicago) and the plan is to increase this number next year.

In addition to direct student recruitment, an increasing number of students will enter Trinity in the coming years from articulation programmes where students spend the first two years in their home university and then transfer into year three in Trinity.

RIGHT – Students celebrating the Indian Festival of Colours, Holi in Front Square



→ In 2016/17, the student body included over 4,774 students from outside of Ireland, with 2,135 of these coming from outside of the European Union, representing 27% and 14% respectively of the total student body.

03

In addition to the International Engineering Programme with Thapar University in India, an articulation agreement with the University of Economics in Ho Chi Minh City (UEH) in Vietnam was signed in November 2016 in the presence of the President of Ireland, Michael D Higgins. This will see 5–10 students annually from UEH enter year three of the Bachelor in Business Studies and will strengthen the existing academic collaboration between the two institutions in the area of Finance.

Last year was the first year of the Trinity International Foundation Programme, a pre-university one-year programme to enable international students to prepare for university admission. It is delivered through a strategic partnership with Marino Institute of Education, an associated college of Trinity. Twenty students from China, South Korea, Malaysia, Nigeria, Bahrain, Saudi Arabia, and Kuwait enrolled and completed the year. A number of agreements with scholarship bodies in the Middle East were signed during 2016/17 and part of the larger cohort of students in 2017/18 will include 23 students from Kuwait.

There is a small but growing number of students from Africa (including South Africa, Burundi, Zambia, Nigeria, Kenya and Ghana) and currently six of these students were successful in obtaining Irish Aid scholarships.

University Relationships

In October 2016 the Provost led a delegation to China and in meetings with leading Chinese universities including Tsinghua, Peking University and Tongji University, he focused on how Trinity embeds innovation and entrepreneurship in its education and research. In Beijing he spoke at the Sino-Irish Education Forum on “Creative Minds for a Smart and Sustainable Innovation Ecosystem”. During his visit, engagement with Beijing Foreign Studies University (BFSU) was further strengthened by the signing of a student exchange agreement and a commitment from both universities to develop joint programmes. This will start with a collaborative programme at Masters level where students, after completing the first year of a Masters in BFSU, will complete a taught Masters in Trinity and return to BFSU for completion of their studies, leading to the award of two Masters degrees.

In July the Provost led a delegation to Canada to visit a number of leading higher education institutes, including the universities of Toronto, Waterloo, McGill, British Columbia, Calgary, and Alberta and Polytechnique Montréal. The visit also provided an opportunity to engage with alumni in Canada - seven alumni events were held from Toronto to Vancouver Island. By coincidence, while the delegation was in Canada, the Canadian Prime Minister, Justin Trudeau, was in Dublin, where he found out that his ancestor, Francis Bernard, was a Trinity alumnus who received his degree in 1729.

BELOW – Global Relations' visits to Universities in 2016–17

BRUNEI	UNIVERSITI BRUNEI DARUSSALAM
CANADA	POLYTECHNIQUE MONTRÉAL MCGILL UNIVERSITY UNIVERSITY OF ALBERTA UNIVERSITY OF BRITISH COLUMBIA UNIVERSITY OF CALGARY UNIVERSITY OF TORONTO UNIVERSITY OF WATERLOO
CHINA	BEIJING FOREIGN STUDIES UNIVERSITY CHINA PHARMACEUTICAL UNIVERSITY NANJING NORMAL UNIVERSITY PEKING UNIVERSITY SOUTHEAST UNIVERSITY TONGJI UNIVERSITY TSINGHUA UNIVERSITY
INDIA	ASHOKA UNIVERSITY OP JINDAL GLOBAL UNIVERSITY THAPAR UNIVERSITY
MALAYSIA	CYBERJAYA UNIVERSITY OF MEDICAL SCIENCES INTERNATIONAL MEDICAL UNIVERSITY MANAGEMENT AND SCIENCE UNIVERSITY SUNWAY UNIVERSITY UCSI UNIVERSITY UNIVERSITI KUALA LUMPUR
SINGAPORE	NANYANG TECHNOLOGICAL UNIVERSITY NATIONAL UNIVERSITY OF SINGAPORE SINGAPORE MANAGEMENT UNIVERSITY
TAIWAN	NATIONAL CHENG KUNG UNIVERSITY NATIONAL CHIAO TUNG UNIVERSITY NATIONAL TAIWAN UNIVERSITY NATIONAL TSING HUA UNIVERSITY NATIONAL YANG MING UNIVERSITY TAIPEI MEDICAL UNIVERSITY TAMKANG UNIVERSITY
THAILAND	CHULALONGKORN UNIVERSITY
US	AMERICAN UNIVERSITY (WASHINGTON DC) BOSTON COLLEGE BROWN UNIVERSITY CATHOLIC UNIVERSITY OF AMERICA COLUMBIA UNIVERSITY GEORGETOWN UNIVERSITY NORTHEASTERN UNIVERSITY PHILADELPHIA UNIVERSITY UNIVERSITY OF PITTSBURGH UNIVERSITY OF SCRANTON
VIETNAM	HUE UNIVERSITY UNIVERSITY OF DANANG UNIVERSITY OF ECONOMICS, HO CHI MINH CITY VIETNAM NATIONAL UNIVERSITY, HANOI VIETNAM NATIONAL UNIVERSITY, HO CHI MINH CITY

BELOW LEFT (L-R) – Global Engagement Award winners, Cliona Hannon, Karen Mortell (accepting on behalf of Prof Brian Foley), Jennifer Taaffe, and Dr John Gormley

BELOW RIGHT (L-R) – President Michael D. Higgins witnessing the signing of an agreement in Vietnam



In addition, visits of Trinity delegations to leading universities in China, India, Vietnam, Singapore, Malaysia, Thailand, and the US also took place during the year.

Student Exchanges

During the academic year, 784 Trinity junior sophister students studied abroad as part of mobility programmes, research placements and elective clinical placements – this represents almost 30% of all third year undergraduates. We continue to expand our college-wide student exchange programmes and in 2016/17, added nine new exchanges in Korea, Japan, China, Hong Kong, New Zealand, Canada and India to bring the number of non-EU exchanges with high ranking universities globally to 44.

During 2016 Trinity became a member of the Consortium for Advanced Studies Abroad (CASA). This allows Trinity students to study alongside their counterparts from other CASA members in locations around the world, in partnership with leading local universities. The first Trinity CASA students travelled to the CASA centre in Havana in January 2017 and, as well as excelling academically, enriched the classroom discussions by bringing a distinctive European perspective to discussions on Latin American Studies and the US/Cuba relationship.

→ During the academic year, 784 Trinity junior sophister students studied abroad as part of mobility programmes...

Research Case Studies

01 Aileen Douglas

02 Anna Davies

03 Brian Lucey

04 Brian Singleton

05 Christine Casey

06 Fabio Boylan

07 Fáinche Ryan

08 Michael Shevlin

09 Tim Persoons

10 Fiona Newell

11 John V Reynolds

12 Siobhán Clarke



BACK (L-R) – Dr Fáinche Ryan, Dr Fabio Boylan, Prof Fiona Newell, Prof Brian Lucey, Prof Brian Singleton, Dr Aileen Douglas, Dr Christine Casey

FRONT (L-R) – Prof Anna Davies, Provost
Dr Patrick Prendergast, Prof Siobhán Clarke

04 Technologies of Writing

Aileen Douglas

The displacement of human work by that of machines is a significant social issue in contemporary society, and one that has long intrigued the popular imagination. One kind of work now performed with much less frequency by human beings is that of manual writing.

The Printing Press – My work focuses on the eighteenth century and a major research interest of mine is the representation of physicality and the body. Most recently I have been studying relationships between the technology of the printing press and the practice and understanding of script. In the early eighteenth century, observers such as the novelist Daniel Defoe could announce that manual writing was at an end, and that the printing press had ‘out-run the Pen’. In fact, the opposite was the case, as printing encouraged more writing of various kinds.

Important here is the dual nature of the printing press as both moveable type and rolling press. Copperplate engraving allowed for the reproduction of images. London became an important centre for the production of copybooks produced by writing masters. Through these copybooks, buyers with no or little access to schooling could teach themselves to write.

Full literacy for all? – In the early part of the eighteenth century there was some hostility to the notion of a fully literate

labouring class, and a fear that if everyone could write then no one would be left to do the tougher manual work that society required. An interesting shift I observe in my research is the slow emergence of the idea that universal writing is beneficial and necessary, part of what it means to be human.

There is a colonial aspect to this as well. Writing was understood as a mark of civilization. The Incorporated Society for English Protestant Schools in Ireland, active from the 1730s on, intended to make Ireland Protestant by making Irish children literate and inculcating in them habits of labour. The archive of the Society, in the library of Trinity College Dublin, shows an obsessive interest in the writing samples produced by children in Charter Schools all over Ireland.

Distinctive autography – In the early modern period, the shapes of letters on the page, the ‘hand’ in which a document was written, was determined by the function of that document. In the eighteenth century, many of these various hands disappear or are simplified and English round hand, the ancestor of modern handwriting, emerges. The idea that handwriting is distinctive, and reveals character, now develops. By the beginning of the nineteenth century the collection and interpretation of autographs is a prominent aspect of polite culture and engraved autographs of notable individuals appear in print.

As print expanded, the ‘author’s hand’ became a novel focus of interest. A poet such as William Blake, who was also an engraver, could control all aspects of his works’ production. Other writers of the period, such as the Irish novelist Maria Edgeworth, understood contemporary interest in the autograph as an unwelcome aspect of literary celebrity, and made it a theme in her fiction.

While researching my recent book, *Work in Hand*, I presented my findings at a number of conferences and events in Ireland and abroad. Questions and observations from audiences confirmed my sense that the historical technological shift my works describes helps illuminate changing ideas of how technology and the human relate in our digital age.



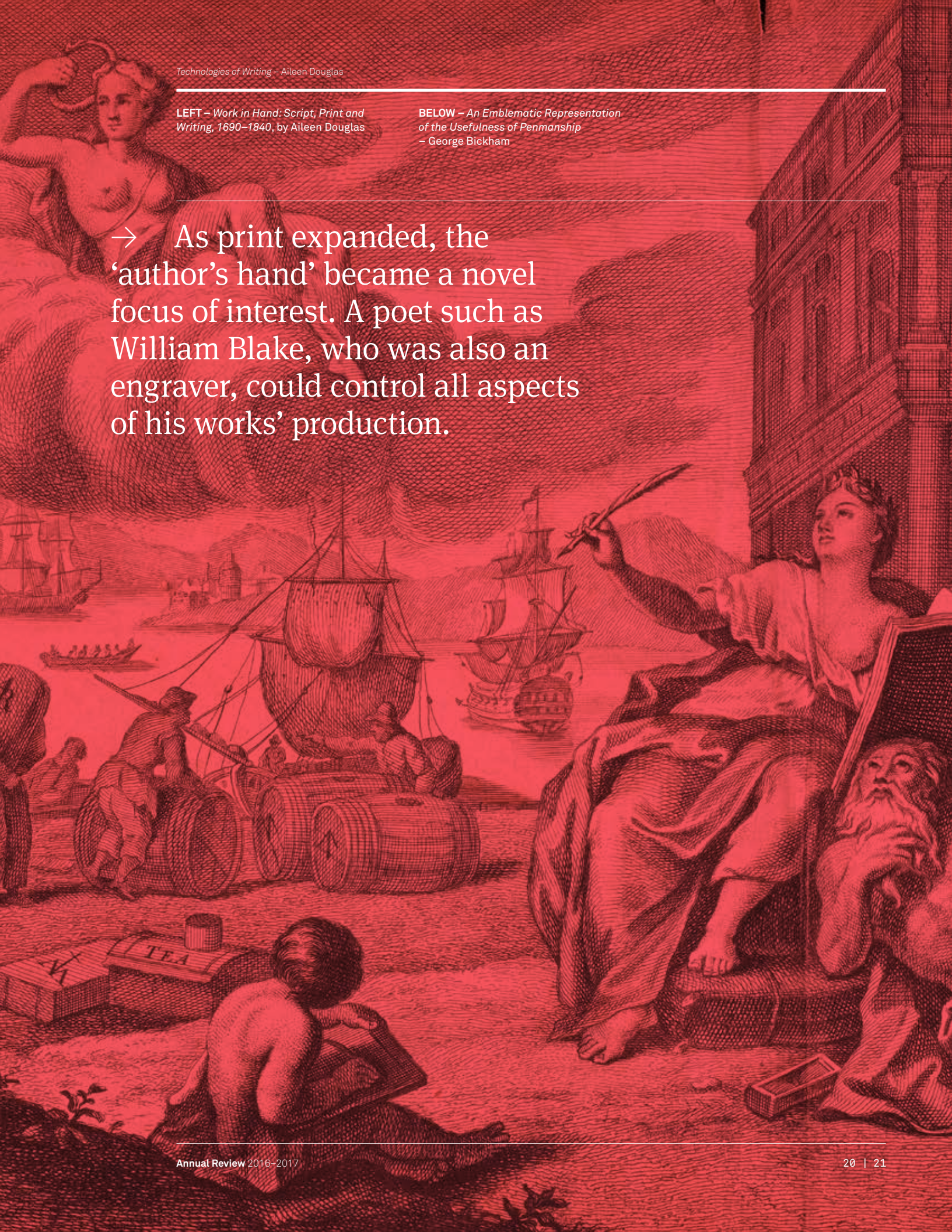
Aileen Douglas holds a BA (Mod) from Trinity College Dublin and a PhD from Princeton University. She began her career at Washington University in St. Louis, returning to Trinity in 1993, and is now head of the School of English. Her most recent publication is *Work in Hand: Script, Print, and Writing, 1690–1840* (Oxford University Press, 2017). Also in 2017, she co-organized Swift350, an international conference at Trinity to mark the 350th anniversary of the birth of Jonathan Swift, and was elected President of the Eighteenth-Century Ireland Society.

Contact: adouglas@tcd.ie

LEFT – *Work in Hand: Script, Print and Writing, 1690–1840*, by Aileen Douglas

BELOW – *An Emblematic Representation of the Usefulness of Penmanship* – George Bickham

→ As print expanded, the ‘author’s hand’ became a novel focus of interest. A poet such as William Blake, who was also an engraver, could control all aspects of his works’ production.



04 Is Sharing Sustainable? ICT Innovation and Urban Food Systems

Anna Davies

When was the last time you and your friends and family ate, cooked or grew food together? Such collaborative activity around food—or ‘food sharing’ for brevity—has long formed the bedrock of human civilisation, securing sustenance, cementing social relations and permitting a division of labour to facilitate the development of specialist skills and to drive innovation across society. However, once an everyday occurrence, food sharing has become the exception rather than the rule for many people, particularly in highly urbanised and industrialised societies. Links have been made between this decline in sharing and a suite of social, economic and environmental problems—from increasing social isolation to the profligate use of finite natural resources.

In CONSENSUS, a research project I led which was funded by the Irish Environmental Protection Agency, we found that both stakeholders and citizens thought that enhanced growing, cooking and eating together would need to be mainstreamed if Ireland is to become more sustainable. Is this really the case?

Sharing economies – Despite the perceived decline in food sharing, there has been something of a renaissance in relation to sharing more broadly, as detailed in a special issue of the *Cambridge Journal of Regions, Economies and Society* that

I recently edited with colleagues from the UK, Canada and the US. In this volume we turned our attention to the considerable innovations in models of exchange that use ICT to connect people in order to organise access to underutilised resources sometimes, but not always, for money. While such activities have become collectively known as the ‘sharing economy’, this moniker has proved controversial not least because such practices may not always align with the ‘sharing is caring’ mantra often used when encouraging children to develop pro-social skills. As a result of this diversity we called for a reframing of debates to focus more carefully on the diversity of these so-called sharing economies.

Certainly concerns are being raised about the impacts that some of these emergent sharing initiatives create

and not only on those who participate in them and the precarious work that they generate. Already there is anecdotal evidence that some activities occurring under the umbrella of the sharing economy can have knock-on effects on wider society—for example in terms of rising rental costs, as home-owners seek to realise income potential from short-term letting facilitated by on-line platforms. There could also be unintended consequences for the environment if, for example, car-sharing initiatives lead to increased trips by motor vehicles using fossil fuels, rather than by more sustainable mobility options such as walking, cycling or public transport. A key problem with identifying the impacts of these new ICT-mediated forms of sharing is the limited data available for analysis. This is where my current project SHARECITY comes in.



Anna Davies received her undergraduate degree and PhD from the University of Cambridge. She joined Trinity in 2001 and is now Professor and Chair of Geography, Environment and Society. Leading the Environmental Governance Research Group, Anna holds a prestigious European Research Council (ERC) Consolidator Grant and received an outstanding achievement award as the highest ranking ERC Consolidator Grant recipient in Ireland in 2017. Widely published, Anna also advises the Irish Government as a member of the Climate Change Advisory Council.

Contact: daviesa@tcd.ie

LEFT – Rooftop garden, Edible Garden City, Singapore

RIGHT BOTTOM – Chooks and Compost, Earth Matters Community Composting, New York City

RIGHT TOP – Organisation Earth, Athens [Photo Credit: Despina Maraki]



SHARECITY – Funded through a five-year European Research Council Consolidator Award, SHARECITY is examining the practice and sustainability potential of ICT-mediated urban food sharing. We have established the first international, open-access and interactive repository of urban ICT-mediated food sharing through the SHARECITY100 database.

To date, we've identified more than 4,000 food sharing initiatives across 100 cities located in six continents and are now drilling down into a selection of these cities to explore their activities active across different phases of

the urban food system. Working closely with these initiatives we will co-design flexible and responsive tools for assessing the sustainability worth of diverse food sharing activities. Ultimately, we will co-produce, with citizens, stakeholders, regulators and sharers, transition plans to support and expand nascent food sharing with the potential to contribute to more sustainable urban food systems. In this way SHARECITY hopes to make a tangible contribution to the global goals of the United Nations 2030 Agenda for Sustainable Development.

→ While such activities have become collectively known as the 'sharing economy', this moniker has proved controversial not least because such practices may not always align with the 'sharing is caring' mantra often used when encouraging children to develop pro-social skills.

04 Golden Opportunities: What Precious Metals Can Tell us About Finance

Brian Lucey

Gold is an enduring mystery, desired, used and traded from humanity's earliest history. It is a metal that can be used as part of industrial processes but also of course as an adornment, and is perhaps most commonly thought of as money. Indeed for much of history, gold, and to some extent silver, were the mainstays of currencies. We speak of gold standards for quality, golden means, gold plated, golden eggs, golden opportunities - gold permeates our consciousness as a touchstone for wealth. What is it about this metal which has held the fascination of people over millennia?

The total value of gold traded worldwide is enormous. Close to 3/4m tons of gold are traded yearly, worth in excess of \$30 trillion, twice the GDP of the whole of the European Union. Yet, all the gold ever mined would fit neatly in a 20 square metre cube on a tennis court. Gold has been known to be a useful part of portfolios for decades, and is often seen as a useful asset to hold in the face of inflation. Given the size of the market therefore, and the linkages that gold has in terms of transferring information to and from other financial assets, a detailed understanding of its dynamics must be a core part of financial research.

Despite the size and thus importance of the gold markets, up to the early 2000s it was a seriously neglected area of interest for academic finance research. In the mid 2000s, post my PhD

on the nature of apparent anomalies in equity returns, I began looking at other markets on which to apply some of the methods I had used, and to serve as a check on the findings in my PhD. Through other research, using tools originally developed in physics literature, I was aware of the gold market. At that time the gold price was beginning to tick upwards after years of marking time and so I began investigating applying these two strands of literature to gold, and from there began to write extensively on gold, other precious metals and more general commodities.

Interrelationships: gold and financial markets – My most recent lines of research are around how interrelationships between commodities (usually precious metals) and economic and financial markets evolve over time. The abundance of daily or even higher frequency data in finance is a boon to some forms of research. However, the danger of focusing down too much is that we lose sight of the fact that finance is ultimately a social science, and thus we need to look at human timescales, if we are to make the strongest social impact.

One strand of this research therefore involves the creation, with colleagues in the UK, of historically linked data, which will allow us to evaluate how these relationships have or have not changed over time. Another involves using methods that allow for evolution in relationships to see when and under

what conditions these hold. An example is the relationship often claimed between gold and inflation, which we find to be very unstable. A second is the crucial role in economic uncertainty in determining whether or not gold is a so called "safe haven" for investors. A third is to surface and disentangle the contribution made to the world gold price by various exchanges – London is the biggest but is not the dominant market, this being New York.

This research has been published in over 20 peer reviewed articles and has formed the basis for a number of symposia and special issues. I have been grateful to obtain funding over the years from the London Bullion Market Association, the leading industry association for precious metal research and refining.

However, the danger of focusing down too much is that we lose sight of the fact that finance is ultimately a social science, and thus we need to look at human timescales, if we are to make the strongest social impact.

Brian Lucey holds a BA from Trinity, in Economics (1985), an MA in economics from NUI (1988) and a PhD in Finance from Stirling University in 2003. He has been a member of Trinity since 1992 and was elected Fellow in 2003. He is Professor of International Finance and Commodities at the Trinity Business School and has published over 100 peer reviewed articles in finance and economics. His present research focuses mainly on the role and function of precious metals as financial assets. Contact: Brian.Lucey@tcd.ie

BOTTOM – Brass lighted gold bar and coin

→ We speak of gold standards for quality, golden means, gold plated, golden eggs, golden opportunities – gold permeates our consciousness as a touchstone for wealth.



04 The Embedded Researcher and the Affective Power of Performance

Brian Singleton

Theatre and performance are socio-political constructs and have tended to reflect, deliberately or unconsciously, the concerns and values of the societies from which they emerge. Their very nature also has the power to render the invisible visible, to give voice to the voiceless, and to showcase peripheral identities in society (in terms of gender, sexuality, race, ethnicity and class) at the very heart of cultural representation.

Irish theatre historically has been indelibly linked to nation building and this has resulted in the erasure of identities that have not found a place in national narratives. My research has always focused on the recovery, representation and analysis of marginalized identities in theatre and performance, and my book, *Masculinities and the Contemporary Irish Theatre* (Palgrave 2011, revised 2015) seeks to uncover marginalized masculinities in Irish society through theatrical means.

Embedded research in and as performance – My current research remains concerned with marginalized identities, erased or ignored over time, but rather than focusing on textual residue in theatre, which often comes in the form of play scripts, I now focus directly on live performance: the process of its creation, its relationship with audiences and its affective power.

My latest monograph analyses ANU Productions' award-winning *The Monto Cycle*, four site-responsive performances (2010–15) that told the story of the quarter-square mile of inner city North Dublin colloquially known as *The Monto*, over the preceding 100 years. Immersed in the sites with daily life all around, these performances blended into the present their representations of various moments of the area's past, from its red-light colonial manifestation, to its postcolonial response in a so-called 'Magdalene laundry', to the loyalist bomb of 1974, the heroin epidemic of the 1980s and the human trafficking of the contemporary moment.

The second production in the *Monto* tetralogy, *Laundry* (2011) was nominated by *The Irish Times* as one of the top one hundred art works of the first century of the Irish republic. When I emerged from the former 'Gloucester Street laundry' where most of the performance of *Laundry* took place, and in which spectators were led alone through installation-like scenes, I felt compelled to talk about it, but not only in the form of research papers at conferences. As part of the rehearsal process for the third production, *The Boys of Foley Street*, I gave a talk to the company on masculinities (the subject of my earlier book), observed the research phase of the fourth production, *Vardo*, and spoke about my research as

part of a Symposium, not in a conference setting, but embedded within one of the sites of the actual performance. Research thus became performance temporarily.

Eventually I sat down to interview the directors Louise Lowe and Owen Boss, studied their research materials and produced my most recent book, *ANU Productions: The Monto Cycle* (Palgrave, 2016). This is specifically written as an eBook—a first for me—because the political power of this type of contemporary culture now lies in the 'experience' of the spectator, and of the researcher being aware of his/her co-presence in that performance.



Brian Singleton received his BA from the University of London and his PhD from the University of Birmingham, and was Postdoctoral Research Fellow of the British Academy. He became Lecturer in Drama at Trinity in 1990 and Samuel Beckett Professor of Drama in 2011. He is the author and editor of six books, and over a hundred peer-reviewed book chapters and journal articles. A former president of the International Federation for Theatre Research, he specializes in uncovering and analysing marginalized identities in theatre and performance.

Contact: bsnglton@tcd.ie

→ Theatre and performance are socio–political constructs and have tended to reflect, deliberately or unconsciously, the concerns and values of the societies from which they emerge.

TOP LEFT – Sorcha Kenny in *Laundry* by ANU Productions (Photo: Pat Redmond)

BOTTOM LEFT – Laura Murray soliciting her escape in *Laundry* by ANU Productions (Photo: Pat Redmond)

ABOVE – Thomas Reilly playing Larry in *The Boys of Foley Street* by ANU Productions (Photo: Pat Redmond)

04 The Work of Many Hands: Crafting the Built Environment

Christine Casey

What is the value of architecture and craftsmanship for Irish society? Why should we maintain and preserve our historic buildings? For many people, architecture may seem a thing apart, and yet of all creative endeavours it has the highest impact on our everyday lives – we dwell, we work, we are educated and we enjoy our leisure and recreation in buildings, not to mention that every time we take a walk or look out the window we're confronted by our built heritage.

While listed buildings are protected by law, much of their value remains at risk and the historic built environment continues to be eroded. Histories, local, national and international are embedded in the buildings of Irish cities, towns and villages, while the distinctive character of Ireland's geology dictates the texture and palette of its architecture. Unlocking these narratives enriches understanding and increases awareness of architecture's value and meaning.

For three decades my research has focused on documenting, analysing and raising awareness of architecture's value and significance - whether in sumptuous Georgian interiors or in the modest but impeccably crafted rubble walls of field or farmyard. My work builds on a distinguished tradition of architectural history at Trinity, established in the 1970s by Edward McParland and Roger Stalley.

Dublin and Europe – The greatest challenge of my career was the documentation of Dublin city, a mammoth decade-long task supported by a state-funded research team, which produced a comprehensive reference work for the architecture of the city, published by Yale University Press in 2005 and widely used by architects, planners, conservationists and the general public. This involved visiting every street and square in the city, photographing, sketching and consolidating manuscript and published materials for all buildings of note. *Dublin* laid the ground work for analysis of the city's Georgian houses and their remarkable plasterwork interiors and led to an absorption with materials and craftsmanship in architecture. Why did Georgian Dublin have such opulent interiors? This initial question led to an exploration of Ireland's place within the wider European context. In the absence of an existing consolidated study, *Dublin* provided the platform to produce an analysis of the entire European decorative phenomenon in *Making magnificence: architects, stuccatori and the eighteenth-century interior* (Yale University Press, 2017).

Making Victorian Dublin – The fundamental role of materials, craftsmanship and industry in fashioning buildings of all periods has not received due attention

and much remains to be known about the quarrying and stone-carving communities who created Ireland's richly decorated Victorian buildings. The spectacular Museum Building of Trinity College Dublin built in the 1850s is the focus of an Irish Research Council New Horizons interdisciplinary grant awarded in 2017 which seeks to explore the interface between geology, industry and building in Victorian Dublin. I am leading the research team, together with geologist Dr Patrick Wyse Jackson; our aim is to achieve a dynamic new interpretation of historic architecture, privileging materials and craftsmanship, and disseminated through a digital reconstruction of the building's original appearance and an illustrated book. Polished stone from all over Ireland was experimented with in this building and opened the way for a colourful new architecture which replaced the restricted palette of the Georgian period and enlivened every town and parish in the country.

While listed buildings are protected by law, much of their value remains at risk and the historic built environment continues to be eroded.

Christine Casey received her BA from UCD and her PhD from Trinity, where she is now Associate Professor in Architectural History. She has held research fellowships in Britain, Europe and the United States and has been a board member of several national organisations for architectural heritage. She is the author of multiple books on Irish and European architecture. She is currently PI on an IRC New Horizons interdisciplinary project focused on Trinity's Museum Building as an exemplar of Dublin's Victorian building industry.

Contact: caseych@tcd.ie

TOP AND BOTTOM – My research demonstrates the significance of craftsmanship in architecture, whether in sumptuous Georgian interiors such as the Saloon in Carton House (bottom image) or in the modest but impeccably made buildings such as the rural house in Co. Louth (top image)

→ ...our aim is to achieve a dynamic new interpretation of historic architecture, privileging materials and craftsmanship, and disseminated through a digital reconstruction of the building's original appearance and an illustrated book.



04 Reaffirming Nature as a Source of Medicinal Raw Materials

Fabio Boylan

Natural products, especially plants, have been used in the treatment of disease for thousands of years, with the first written records on the medicinal uses of plants appearing about 2600 BC from the Sumerians and Akkaidians. The *Ebers Papyrus*, the best-known Egyptian pharmaceutical record, which documents over 700 drugs, dates from 1500 BC and the first records of the Chinese *Materia Medica*, describing over 600 medicinal plants, date from about 1100 BC. Today the World Health Organization estimates that approximately 80% of the world's inhabitants continue to rely on traditional medicine for their primary health care.

The term 'ethnopharmacology' was used for the first time in 1967, although the principle behind the discipline was described by the German pharmacologist, Louis Lewin, in his masterpiece *Phantastica* in 1924. Originally defined as the science behind using natural resources as drugs, ethnopharmacology was defined by Bruhn & Holmsted in 1981 as 'the interdisciplinary scientific exploitation of biological active agents traditionally used or observed by people'. Ethnopharmacological studies are premised on respect for, and validation of, cultural diversity and local traditional knowledge of medicinal uses of natural resources.

My research at the School of Pharmacy and Pharmaceutical Sciences is focused on:

- Proving the benefits (if any) of the natural medicines being used by disadvantaged communities (poor or absence of primary health care) in Europe, Asia and Americas;
- Discovering the reasons for negative, or even seriously toxic effects arising from the use of the various natural medicines under scrutiny for those communities;
- Being able to advise the communities, in the most basic terms, that there are alternative plants (and/or alternative uses for previously misused plants) that can provide medicine if used in a particular or different manner.

Fighting cancer and arthritis with plant products

— With my research group in the School of Pharmacy and Pharmaceutical Sciences, I have been collaborating with researchers in countries around the world to discover and validate the pharmacological actions of different plants in the treatment of serious diseases including cancer and arthritis – diseases which were once associated primarily with developed countries but are now rapidly on the rise worldwide.

Plants have been used in the treatment of cancer since the 1950s, with the discovery and development of the Vinca alkaloids, vinblastine and vincristine, and the separation of the cytotoxic

podophyllotoxins. In collaboration with Brazilian researchers, my team has been researching into the pharmacological action of a Palm from the Amazon Forest. We have discovered that fruits from this plant can be divided into different parts, with one part targeting leukaemia and the other benign prostate hyperplasia.

Non-steroidal anti-inflammatory drugs (NSAIDs) are the first line of therapy in, for example, acute gouty arthritis—they work by inhibiting the cyclooxygenase pathway, but not the lipoxygenase activity, and therefore have only limited control on inflammation and may have adverse effects. There is a need to search nature for more specific anti-inflammatory drugs. Working with researchers from Brazil and Serbia, my group has established that Ternanthrin, identified in the essential oil *Choisya ternata* from a Mexican plant belonging to the family Rutaceae, has displayed excellent pain-killing and anti-inflammatory properties in preliminary studies.

Non-steroidal anti-inflammatory drugs (NSAIDs) are the first line of therapy in, for example, acute gouty arthritis—they work by inhibiting the cyclooxygenase pathway...

Fabio Boylan received his BSc, MSc and PhD from the Federal University of Rio de Janeiro and joined Trinity's School of Pharmacy and Pharmaceutical Sciences as a lecturer in 2008. He is now Associate Professor of Pharmacognosy and PI with the School and the Trinity Biomedical Sciences Institute. Recipient of several research grants with collaborators overseas, he has published almost 100 articles in peer-reviewed journals. His research focuses on the validation of the popular use of medicinal plants by different populations by assessing their chemical and pharmacological properties, with the aim of developing safe and effective medicines derived from nature.

Contact: Fabio.Boylan@tcd.ie

Fig 1. Treatment of Leukaemia cell line HL-60 with Babassu fruit extract. Diagrams C and D show completely disorganization of the cellular structure, less viable cells and condensation of chromatins pointing out to their destruction.

A Leukaemia cell line HL-60 (Control Group)
B Leukaemia cell line HL-60 (Treated with Ethanol)
C and D Leukaemia cell line HL-60 (Treated with Babassu extract in ethanol)

In a separate study, working with Chinese plants, my group was able to validate an extract from *Elsholtzia ciliata* as a natural antimicrobial with important bactericidal and fungicidal actions.

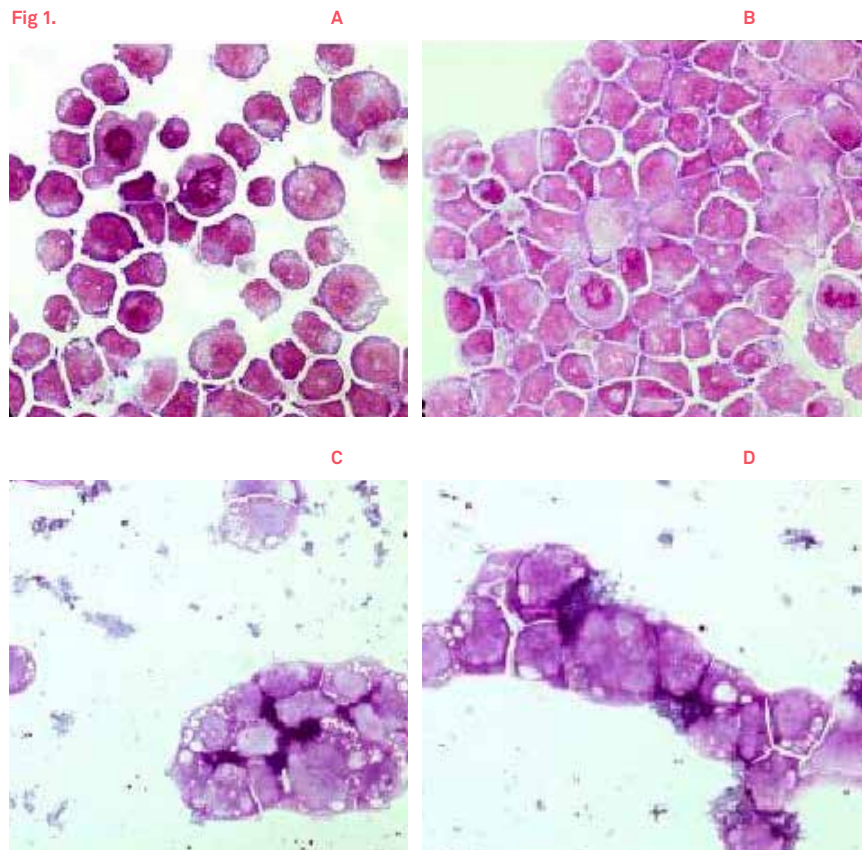
More recently, collaborative work with Kazakh scientists has allowed for the development of monographs of endemic Kazakh plants for inclusion into the Kazakh National Pharmacopoeia, replacing non-native European plants. This research has enabled the development of tools to analyse the chemical

compounds in plants, validating their pharmacological actions and guaranteeing their quality control as raw materials. In addition, the quick one-step removal of toxic compounds from the chemical composition of medicinal plants has led to the identification of important pharmacological actions.

The impact of my research is translated by the number of papers published in high impact journals in the area of Natural Products. It also envisages to finding natural templates or scaffolds that can be used as it is or modified to try

and understand the relationship between cancer and inflammation. Once translated into the Irish Flora it could attract industries potentially interested in the area of Natural Products to invest in the global understanding of plant derived anticancer and anti-inflammatory agents and the relationship between them. My research also reinforces Ireland as a top nation in drug development based on medicinal plants from overseas.

→ ...approximately 80% of the world's inhabitants continue to rely on traditional medicine for their primary health care.



04 The Importance of Truth Telling for the Health of Society

Fáinche Ryan

My current research is engaged with the phenomenon of post-truth and its widespread proliferation in today's society. Post-truth was announced as the Oxford Dictionary's Word of the Year 2016, with great fanfare. The concept 'post-truth' is defined as denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief. Widespread social usage of this concept seems to favour the expediency of result over the importance of truth telling.

This research prompted a return to earlier work on the concept of virtue, with a focus now on the virtue of truth telling. As previously, my first port of call was the theologian Thomas Aquinas. Developing Aristotle's philosophy, Aquinas understands virtues as being the skills, or the learnt dispositions of character, that enable humans to live well in society, and that enable human society to flourish. The virtue of justice governs our relationships with others - specifically, it denotes a sustained or constant willingness to extend to each

person what he or she deserves. It is significant that for Aquinas the virtue of truth telling is embedded in the larger topic of the virtue of justice. Justice is what we owe to one another and what is owed to us in a flourishing society. Aquinas' argument is that it is owed to me as a member of society that others speak truth to me - otherwise I cannot flourish. Similarly I owe it to you that I tell the truth to you. For Aquinas a persistent failure in truth telling is first and foremost an act of self-corruption, and thereby an act of societal corruption. Furthermore, unless we are truth telling, we cannot trust one another, and without trust, society crumbles.

The objective of my research is to demonstrate that contemporary complacency with the concept of post-truth, in both politics and media, needs to reckon with these arguments about the centrality of the virtue of truth telling for individual and societal flourishing.

This academic year I have presented papers on this topic at two international conferences, leading to fruitful discussion. I am currently working on an

article for publication in a peer-reviewed journal. The objective of this article is to contribute to society's debates on issues that are arising around the concept of post-truth.


Truth telling and ecclesial institutions

Truth telling is crucial to the health of institutions, no less to that of church. In this regard my research is focused on the locus of authority within the institutional Church. My work here involves the study of the lost memory of the leadership of women as well as seeking new authentic expressions of ecclesial leadership. I have completed a chapter on this theme for a book entitled *Social and Political Roles for Church in Contemporary Pluralist Society*.

My ongoing research combines these interests in ecclesial leadership and the importance of truth telling. I continue to present and publish papers on these topics, with a book length study as my medium term goal. My objective is to make a significant contribution to widespread contemporary interest in the area of ecclesial leadership, as well as to influence change.

Fáinche Ryan holds a BA from the Kimmage Mission Institute, an MA from Milltown Institute and a PhD from the University of St Thomas Aquinas (Rome). Her first academic appointment was at the Margaret Beaufort Institute in the Cambridge Theological Federation. In 2013 she joined Trinity's Loyola institute as Assistant Professor in Systematic Theology and is the current Director. Her publications include *Formation in Holiness. Thomas Aquinas on Sacra Scriptura* and *The Eucharist. What do we believe?* She was President of the Irish Theological Association from 2012 to 2017.

Contact: faryan@tcd.ie



→ The concept ‘post-truth’ is defined as denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief.

04 Addressing Marginalisation within Society — Establishing Inclusive Learning Environments

Michael Shevlin

Widening societal participation for people from marginalised groups has become an established feature of policy frameworks in Ireland and internationally. Irish policies have developed rapidly over the past couple of decades and the initial focus on people from socio-economically disadvantaged groups has been extended to include people with disabilities and/or special educational needs. The majority of pupils with disabilities and/or special educational needs are now educated in mainstream schools whereas in the recent past these pupils were often assigned to special schools. As a result mainstream schools face a number of challenges in establishing inclusive learning environments as mandated in official government policy and increasingly expected within society.

Within the School of Education, the Inclusion in Education and Society research group, which I lead, is based on the central principle of supporting the inclusion of people from marginalised groups in education and society through focused research and examining inclusive theory, policy and practice within education.

Project IRIS (Inclusive Research in Irish Schools) — The Inclusion in Education and Society research group, along with colleagues in the University of Northampton and ICEP Europe, conducted a major longitudinal study (Project IRIS) (2010-2015)

designed to investigate educational provision for children and young people with disabilities and/or special educational needs within a range of Irish primary, post primary and special schools. The study reported substantial progress in developing learning and social supports within schools and high levels of parental satisfaction with provision. However, significant difficulties remain including inequitable access to assessments of need and inadequate therapeutic supports. This research has helped to shape government policy in relation to developing more inclusive learning environments such as establishing more equitable resource provision in Irish schools.

Trinity Centre for People with Intellectual Disabilities (TCPID) — Traditionally people with intellectual disabilities (ID) have been among the most marginalised groups within society, perceived as dependent, passive and unable to make a meaningful contribution to their communities. Educational expectations for children and young people with intellectual disabilities have usually been influenced by deficit based models. I along with colleagues in the School of Education established The Trinity Centre for People with Intellectual Disabilities (TCPID) in 2014 (following on from the National Institute for Intellectual Disability and the Certificate in Contemporary Living)

within the Inclusion in Education and Society research group, with the explicit aim of developing an inclusive learning environment within higher education and enabling young people with intellectual disabilities to forge independent lives and gain meaningful employment. An Arts, Science and Inclusive Applied Practice (ASIAP) programme has been developed at Level 5 Certificate (major award) on the National Qualifications Framework. This is designed to enable participants to develop their learning skills and make a successful progression into employment or to avail of further educational opportunities. A network of business partners has been established who provide work placements through a mentoring programme and a number of previous graduates from the Certificate in Contemporary Living programme have attained employment contracts. As Mei Lin Yap, one of those graduates, observes: ‘When I dream big I need others to dream big with me.’

This research has helped to shape government policy in relation to developing more inclusive learning environments such as establishing more equitable resource provision in Irish schools.

Michael Shevlin received his BA degree from NUI Maynooth and his PhD from Trinity College Dublin. He joined Trinity College in 1996, having worked as a post-primary teacher. He served as Head of School and is Chair of AHEAD an organisation dedicated to improve access to further and higher education and employment for people with disabilities within Irish society. He has been published widely and is engaged in research on transitions to postsecondary education for young people with disabilities.

Contact: mshevlin@tcd.ie

04 Optical Illusions in the Quest to Reduce the Internet's Energy Bills

Tim Persoons

Data centres are huge warehouse-sized facilities with thousands of computers that form the backbone of Internet services like Google, Facebook, Amazon, Dropbox, etc. Between 2000 and 2010, the global electricity consumption of data centres was increasing by 11% per year to 27 GW in 2010, or 1.3% of the total worldwide electricity production.

While this global growth has slowed somewhat in recent years, Ireland has seen a rapidly growing presence of data centres. In 2016, Irish-based data centres consumed 250 MW of electricity – as much as 8% of the national electricity production. Eirgrid expects this number to surpass 15% by 2019.

In a typical data centre, over a third of the total energy goes to the cooling system, which is designed to keep the computers running without overheating. In our cooler Irish climate, some data centres work without mechanical refrigerators, relying only on the outside air to cool the data centre halls. This saves some energy on cooling, but the computer fans then need to work harder to pump greater volumes of air through the servers.

For most large data centres in Ireland, this is the case. However, in an ideal situation, there would be some way of recuperating the hundreds of megawatts used by the computers themselves, which is now discarded into the atmosphere. Since most of the heat is being generated

in the processors (CPUs), thermal management research is currently focusing on developing smart ways of extracting heat directly from the CPUs.

Measuring flow fields – In the Fluids & Heat Transfer lab in the Department of Mechanical and Manufacturing Engineering, my team studies the fundamentals of adaptive flow manipulation at solid/fluid interfaces. The overarching goal is to develop reliable cooling methods that can modulate local heat transfer rates and redirect flows towards the hottest components, to respond to rapid changes in computational loads. This applies both to large-scale air cooling (the size of computer servers, racks or entire rooms) down to small liquid-cooled heatsinks of the same size as computer processors (a few cm²), with micro-scale flow passages for the liquid coolant to extract heat from the electronics in precise amounts and locations.

An important challenge in developing new adaptive convective cooling technology is the need to visualise and quantify complex turbulent flow fields. Understanding convective cooling starts with fluid mechanics, yet air currents and small eddies in water flows are invisible. We use computational fluid dynamic (CFD) simulations to predict how the flow behaves, but the final proof is in measuring it in real life, with enough detail in

space and time to truly understand and optimize thermal flows.

Measuring flow fields takes a bit of optical trickery, whether it is air or water, large or small scale. We customise pulsed lasers and LED lighting systems with high-speed cameras to track micro-metre-sized tracer particles in air or liquid flows. Using particle image velocimetry, we are able to measure accurate turbulent flow fields alongside heated surfaces in fine detail.

Traditionally, a heat-generating electronic component like a CPU processor has been air-cooled by a 'heatsink'. This passive metallic heat exchanger spreads the heat generated by the CPU chip out to a larger surface area, so that it can be transferred to a surrounding airflow. Heatsinks tend to have rows of thin parallel plates or fins that protrude out into the flow. The air is forced through a series of narrow passages that promote fine-scale mixing, and allow it to absorb and carry away the heat. Because of the complex internal structure of heatsinks, flow field measurements inside heatsinks are particularly challenging. Therefore, we use another optical illusion and match the liquid coolant's refractive index to that of transparent heat sink models, making the pulsed light pass through complex 3D models unobstructed, allowing us to measure more accurately right at the solid/fluid interfaces and around corners.

Tim Persoons received his MSc and PhD from KU Leuven, joined the School of Engineering in 2006 as research fellow, and was appointed Assistant Professor in Engineering in 2013. He is a visiting faculty member of the NSF Cooling Technologies Research Center in Purdue University, and investigator in SFI ESIPP and CONNECT. Tim has published over 100 articles in peer-reviewed journals and conference proceedings. His research focuses on multi-scale convection and flow control for electronics thermal management and sustainable energy technologies.

Contact: Tim.Persoons@tcd.ie

Fig 1. Cylinder array in cross-flow in a water tunnel test facility with refractive index matching for unobstructed velocity measurements in complex geometries, such as advanced heatsinks

Fig 2. Laser sheet flow visualisation of a synthetic jet emanating from a circular cylinder

Fig 3. Cylinder with embedded synthetic jet flow control actuator, mounted in a water tunnel test facility, with laser sheet illumination from below to visualise flow near synthetic jet orifice using 50 micron polyamide PIV tracer particles

Fig 4. Electro-hydrodynamic or plasma actuation for low power enhanced natural convection cooling

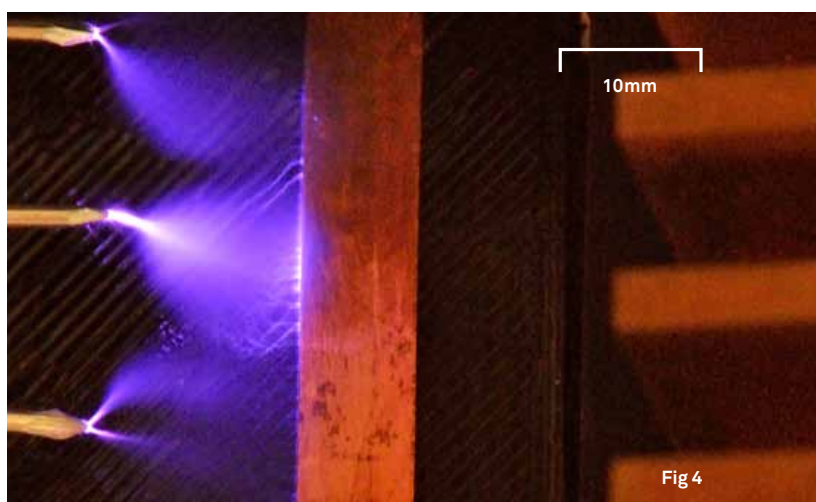
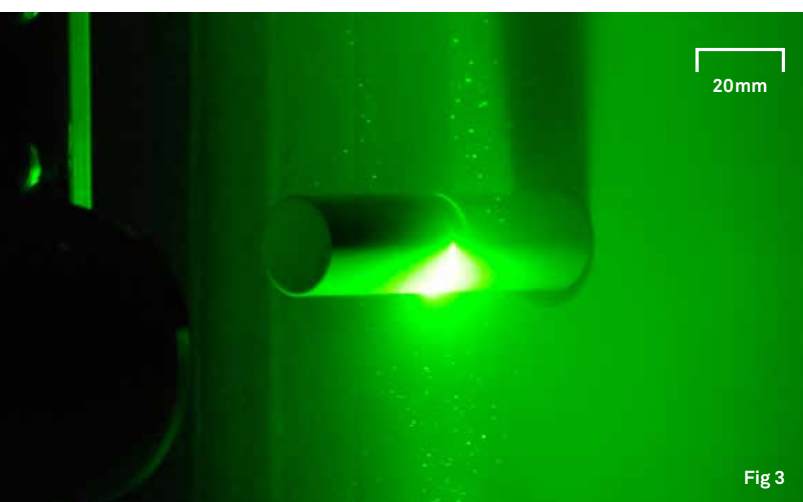
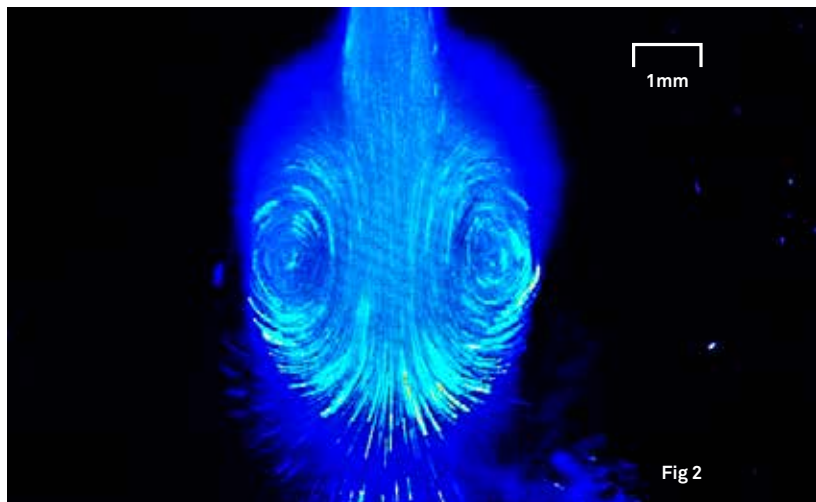
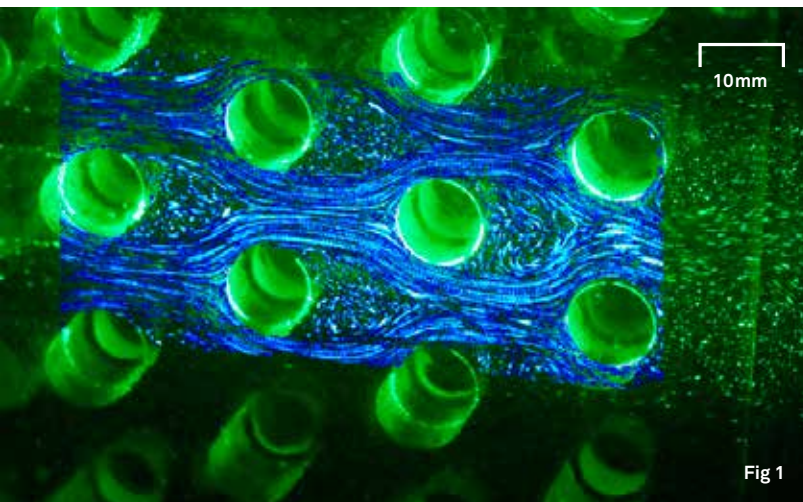
Our measurement facilities are designed and built in-house using advanced manufacturing and the help of skilled technical and experimental support staff.

Along with industrial partners (Nokia, Analog Devices, and General Electric), we are looking at different ways of manipulating flows using oscillatory or 'synthetic' jets, other pulsatile flows or acoustics, or even magnetic or electric fields. All of these methods act on boundary layers, and allow us to gently 'nudge' flow fields in the desired direction, or increase or decrease heat transfer as needed, with minimal effort.

Such adaptive flow control technology could mean big energy savings for electronics cooling in data centres, but it also has applications far beyond electronics. Examples include drag reduction for ground or marine transportation and avoiding separation on aircraft wings, for next-generation large passenger aircraft.

Our work is supported financially by a variety of sponsors including Science Foundation Ireland, Irish Research Council, Enterprise Ireland and our partner companies.

... the global electricity consumption of data centres was increasing by 11% per year to 27 GW in 2010, or 1.3% of the total worldwide electricity production.



04 How Does the Human Brain Make Sense of the External World?

Fiona Newell

We live in a multisensory world and our senses are constantly bombarded by stimulation from the sounds, sights, smells and tastes from the outside environment. The human brain is continually challenged with the task of maintaining a coherent perception despite this ongoing cacophony of sensory stimulation. Our brain has the remarkable capacity to inhibit irrelevant sensory information and merge relevant information, from across multiple senses, to allow us to appropriately engage with the world. It appears to do this by organising sensory information in a task-specific manner. For example, a specific region of the brain is involved in object perception whereas another underpins the perception of the object's location. My research tries to understand how the brain achieves the seemingly incredible feat of perception.

Together with my research team in the Institute of Neuroscience, our approach takes a cognitive neuroscience perspective and involves different methodologies, from psychophysical studies, to neuroimaging using Magnetic Resonance Imaging or EEG. We also study unusual perceptual conditions, such as synaesthesia, to help elucidate the links between brain function and phenomenological experiences. This broader research programme is supported by on-going cross-disciplinary and cross-faculty collaborations with other research groups

within Trinity, such as Prof Carol O'Sullivan in Computer Science, Prof Kevin Mitchell in Genetics, and Prof Rose Anne Kenny in Medicine.

The wonders of human perception — We investigate common, everyday perceptual tasks that are seemingly effortlessly performed every minute of our lives, yet the behavioural and brain processes underpinning those tasks are not yet well understood. Taking face perception as an example, I ask how does the brain solve the problem of identifying familiar faces from the thousands of faces we have encountered in our lives? Even the best computer systems often fail to recognise images of familiar faces that are altered by incidental changes such as lighting, viewpoint, hairstyle, ageing, but such changes do not appear to affect the performance of the human brain. At the same time, face perception must remain sensitive to momentary changes in eye gaze and expressions, so that we can perceive the attention and intentions of others (Fig. 1), and link those momentary changes with other sensory information, such as sound for speech perception. I gain greater insight into how the brain works by also investigating when these processes break down: for example, prosopagnosia is a condition associated with an inability to recognise familiar faces, including family and

friends. We try to understand the basis of this specific perceptual condition using several approaches, but more recently by comparing the eye movements of a prosopagnosic patient observing a face with those of persons who can recognise faces (Fig 2).

The knowledge I have acquired to date on human perception has been applied in a number of ways. Our recent research has used Virtual Reality technology to build a serious game intervention that improves perceptual function in older adults (see Fig 3). After just a few sessions of playing the game, we found observable changes in the brain of older adults (see Fig 4). As part of an EU-funded H2020 project, entitled 'WeDraw', and in collaboration with IIT in Italy, UCL in UK, as well as pan-European games companies, we are developing technology that helps both sighted and visually impaired children to acquire geometrical and arithmetic concepts. Our aim is to go beyond visual examples, and incorporate multiple sensory systems to support this learning in children in a fun and engaging way.

Fiona Newell received her BA from Trinity and PhD from University of Durham, UK. She joined the School of Psychology in Trinity as a lecturer in 2000, following post-doctoral positions at Cambridge, UK, Weizmann Institute, Israel; and Max-Planck Institute, Germany. She is now Professor of Experimental Psychology based in the Institute of Neuroscience. She has published almost 100 articles in peer-review journals, and acts as associate editor for leading journals. Her research interests lie in human sensory and perceptual processes.

Contact: Fiona.newell@tcd.ie

Fig 1. How does the brain recognise the faces, as well as the intention and attention, of others?

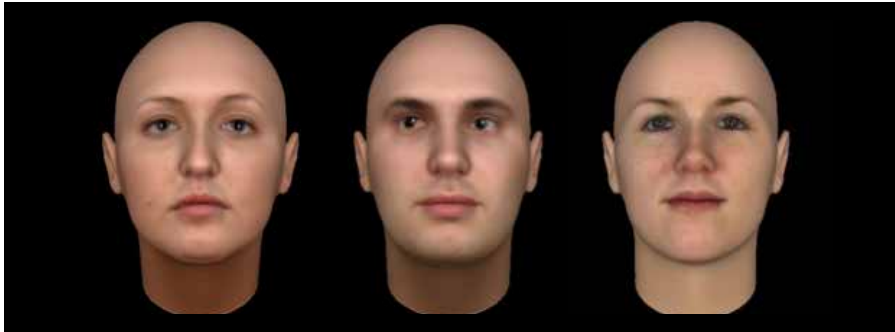


Fig 2. Typically, when we encounter a new face, we tend to scan all features but especially the eye region of a face (bottom left). In contrast, someone with prosopagnosia typically spends more time looking at other facial features, such as the mouth (bottom right), that have more to do with speech than face perception.

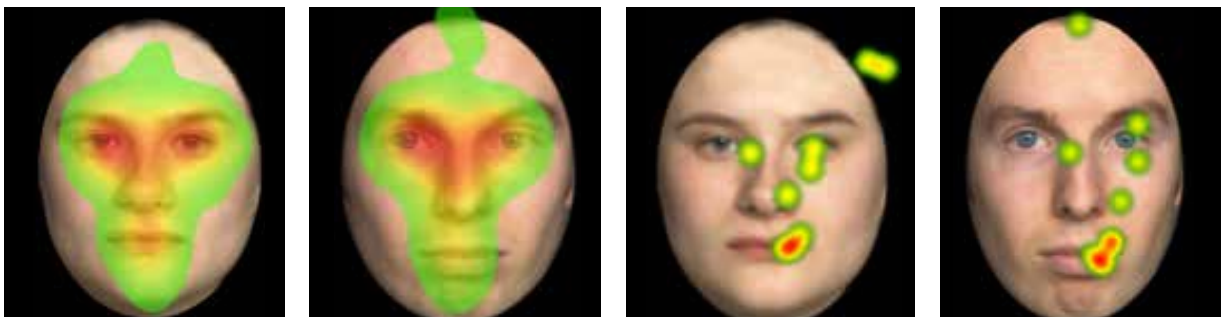
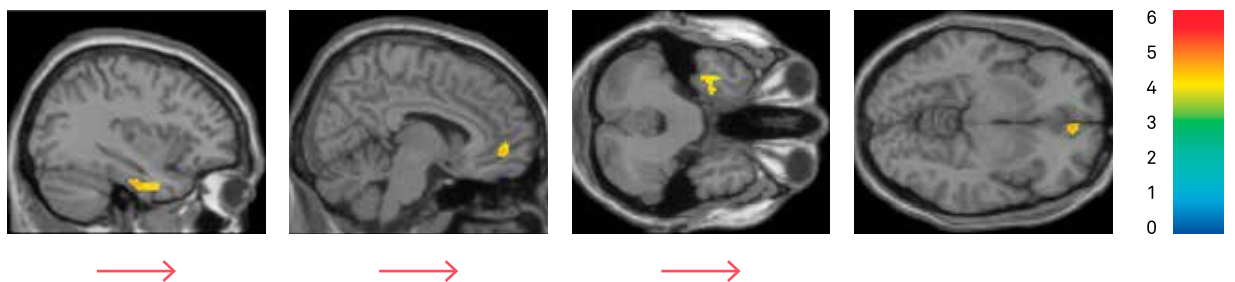


Fig 3. For older adults, memory for novel objects is enhanced if encountered within images of familiar (e.g. left) than unfamiliar (e.g. right) environments.



Fig 4. The structure of specific regions within the brain of an older adult can increase with practice on a serious game.



04 Targeting Oesophageal Cancer from the Bench and Bedside

John V Reynolds

Oesophageal cancer has increased in incidence globally almost 6-fold over the last 30 years. There are approximately 450 cases per year in Ireland, with almost 400 deaths, highlighting that it presents usually at an advanced stage and is difficult to cure.

The integration of science and medicine defines the model of best cancer care in the leading comprehensive cancer centres internationally, and to this end Trinity College Dublin aligned with St James's Hospital in February 2017 formally launched a combined initiative to develop a Cancer Institute founded on such principles, unique for Ireland, and rich in research opportunity. Trinity's Department of Surgery at St James's Hospital has a particular focus on translational oesophageal cancer research. The hospital is the National Centre for Oesophageal Cancer, and translational research in premalignant and malignant disease of the oesophagus is a major theme within the Trinity Translational Medicine Institute (TTMI). Some key themes are as follows:

Obesity and cancer – Oesophageal cancer is an obesity-associated cancer, particularly in men, and especially related to central obesity ('belly fat'), as well as associated type 2 diabetes, and fatty liver. Excess unhealthy fat can drive

inflammation and fuel cancer development, and we have shown that this 'belly fat' is a hive of increased activity of immune cells and can alter the energy metabolism of cancer cells allowing them to remain immortal.

Inflammation to cancer: The role of reflux

Most oesophageal cancer arises in the context of symptoms of excessive acid and bile causing heartburn and reflux. About 10% of such sufferers acquire an identifiable change in their oesophagus known as Barrett's oesophagus which may be pre-malignant. We lead a National Barrett's Registry and Biobank which links six Irish hospitals to better understand the clinical management and disease progression rates of this disease model to inflammation causing cancer, and to develop scientific tests to predict which patients will progress to cancer. We have shown that alterations in immune cell function, energy metabolism and genomic instability have the potential to distinguish patients at high risk, permitting precision management and the potential of novel targeted therapies.

Increasing cure rates using novel diagnostic and therapeutic platforms (theranostic programme) – Patients with oesophageal cancer typically undergo chemotherapy, alone or combined

with radiation therapy, prior to surgery. Less than half benefit meaningfully from this pre-surgery therapy, so the ability to predict response has enormous application in improving outcomes through predictive modelling and personalised medicine. A recent article from our group highlighted the importance of a microRNA (miR-17) in cancer stem cells in controlling radiation response. We are currently investigating whether adding a synthetic miR to radiotherapy enhances effectiveness. In addition, in collaboration with a company in New York (miR Diagnostics), we have developed a microRNA signature which is being tested across multi-sites for its sensitivity and specificity in segregating patients with good and poor response to radiation and chemotherapy prior to surgery. We are leading an international randomised clinical trial (NeoAEGIS) of 600 patients, coordinated through Cancer Trials Ireland, and involving international scientific partnerships including Cambridge University and Imperial College London. Our drug discovery therapeutics programme has identified and patented novel dual action drugs that act as radiosensitisers and can potentially help patients resistant to therapy by specifically targeting blood vessels (Figures 1 and 2) and energy metabolism levels in cancer cells.

John Reynolds is Professor of Clinical Surgery at St James's Hospital and Trinity and PI in the Trinity Translational Medicine Institute. He is the National Lead for oesophageal and gastric cancer. He has held Fellowship positions with the University of Pennsylvania, Wistar Institute in Philadelphia and Memorial Sloan-Kettering Cancer Centre, New York and was a Senior Lecturer at St James's University Hospital, Leeds. A recipient of numerous research awards, he has published widely in cancer research, with over 300 publications and c €6m research grant income. His clinical interest is in diseases of the oesophagus and stomach.

Contact: reynoljv@tcd.ie

Fig 1 – Dual immunofluorescent staining of blood vessels in the tumour. The red colour highlights the blood vessels and the red shows the blood vessels that are mature. The levels of mature and immature vessels in a tumour correlate with response to treatment.

Fig 2 – We use the zebrafish model system as one model to screen for novel dual action drugs that target blood vessels (in green) and energy metabolism prior to testing in human cancer explants.

→ We are currently investigating whether adding a synthetic miR to radiotherapy enhances effectiveness. In addition, in collaboration with a company in New York (miR Diagnostics), we have developed a microRNA signature which is being tested across multi-sites for its sensitivity and specificity in segregating patients with good and poor response to radiation and chemotherapy prior to surgery.

Improving the patient journey – There is no more complex cancer operation than removal of the oesophagus, which carries a high risk of morbidity. In collaboration with the Discipline of Physiotherapy we have developed programmes, conducted at the Wellcome/Health Research Board clinical research facility, targeting the optimisation of patients' physical wellbeing and conditioning through prehabilitation (PREPARE trial), and rehabilitation following treatment and extending into survivorship (ReStOre trial).

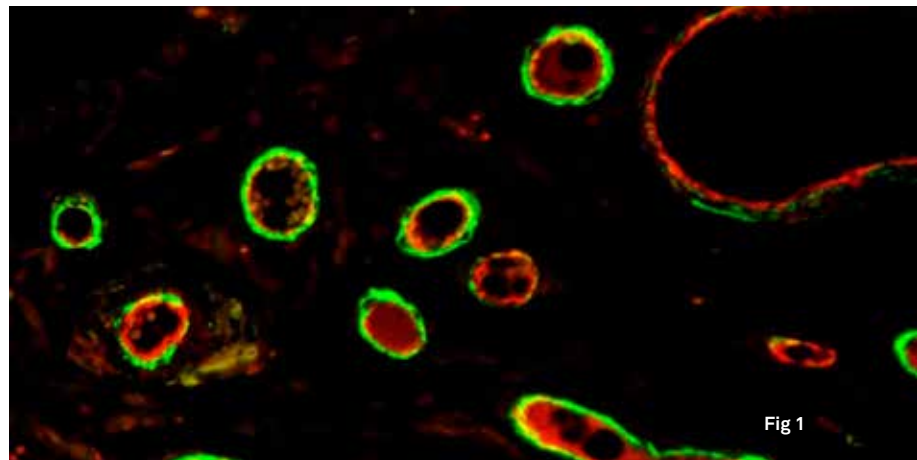


Fig 1

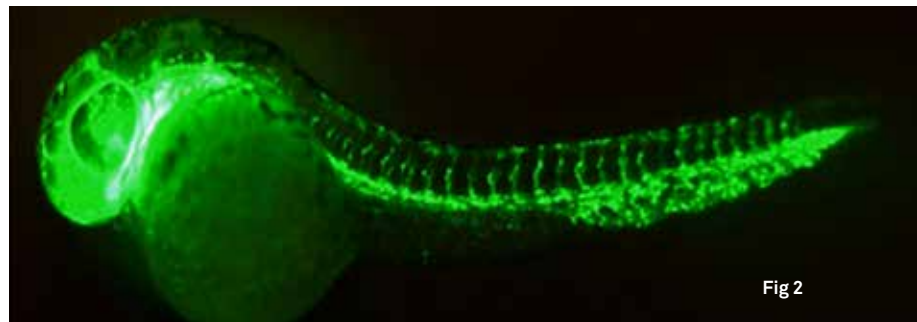


Fig 2

04 Resilient Software Services in Urban Environments

Siobhán Clarke

With significant population growth in cities, there is growing pressure on infrastructure and resources and this affects quality of life, impacts the environment and limits economic growth. On the other hand, the increasing availability of real-time information from a myriad of mobile and embedded sensors (e.g. smart phones, energy/water meters, roadside monitoring units, vehicles, buildings etc.), combined with high bandwidth network connectivity, creates the potential for the deployment of innovative software services that manage cities' infrastructure and resources more effectively. However, a key challenge to enabling the development of such software services is to cater for the inherently dynamic nature of the underlying infrastructure environment from multiple dimensions. An infrastructure supporting software services must cater for resource-constrained and possibly mobile devices that are likely to be heterogeneous and geographically dispersed. Services must be interoperable across city domain silos, and it should be possible to compose them, for the provision of higher-order services, dynamically and in a timely manner.

My research expertise is in software engineering, and I have a strong sense of the significant shortcomings in the methods and techniques available to software engineers who are tasked to build software services to execute reliably in such an urban environment. In my early career, I published highly influential work on the use of "aspects" in software modelling, called Theme/UML, which provided new techniques to improve the modularisation and composition of software models, designed to be generally applicable to a range of domains operating in stable environments. However, the fundamentally challenging nature of emerging computing systems is such that assumptions related to centralised knowledge of software services' availability, representation and interoperability are invalid. This makes existing software applications useless in such environments, significantly limiting the potential for addressing global challenges in urban sustainability.

My research goal within this wholly under-researched area is to provide new service-oriented software engineering techniques that enable the development of dynamically adaptable applications,

using innovative run-time service composition algorithms that support resilient service provisioning even in the face of a dynamically adapting network of potentially heterogeneous service providers. Enabling such services-based development requires a combination of new techniques, and my research group within the School of Computer Science and Statistics has published work on predicting potentially damaging emergent behaviour that may affect future quality of service; registering and discovering the "right" services at the "right" time in the "right" place; and a self-organising, goal-driven approach to dynamically composing and re-composing services. Funding for this work has come primarily from Science Foundation Ireland.

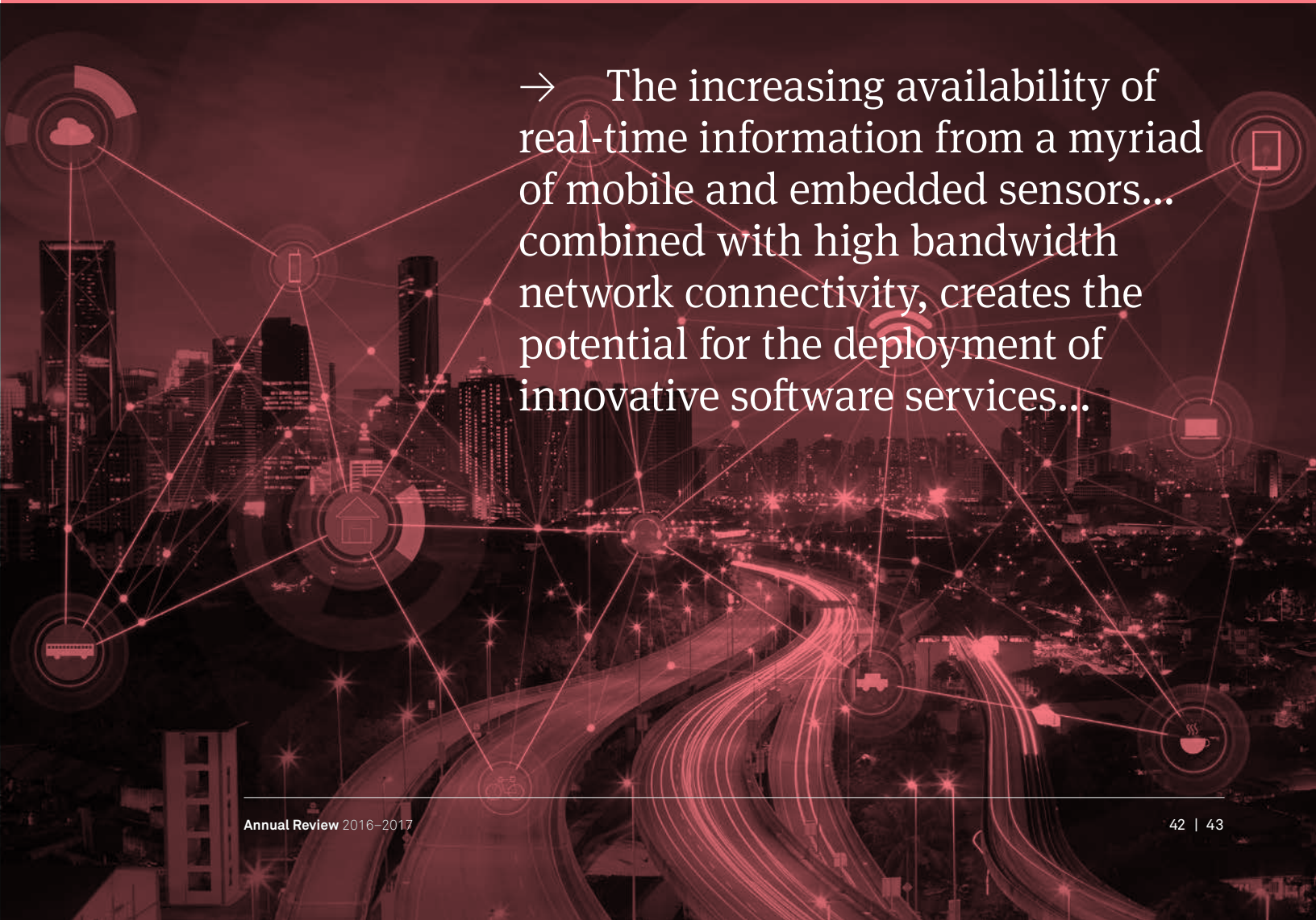
Enable will develop new technology to improve the way we manage our cities to benefit people, communities and the environment.

Siobhán Clarke received her BSc and PhD degrees from Dublin City University. She joined Trinity in 2000, and is Professor in Computer Science. She was elected Fellow of Trinity College Dublin in 2006 and is Director of the Trinity Future Cities Research Centre. She has published 170 peer-reviewed papers, and leads the Enable SFI Spoke on Connecting Communities. She is co-PI of the Connect, Insight and Lero SFI Research Centres. Her research focus is on engineering dynamic software services in urban-scale environments.

Contact: siobhan.clarke@scss.tcd.ie

Smart environments. Connected communities — Sustainability of our cities also requires finding new ways to enable behavioural change, the solutions to which are inherently multi-disciplinary. I lead a large-scale (€12m) SFI Spoke project, called Enable, which leverages expertise from the Connect, Insight and Lero Research Centres. Enable is a multi-disciplinary collaboration between 20 PIs from 7 HEIs, 28 companies and Dublin and Cork City Councils, and is the first national collaboration between companies, academia and public bodies in the

area of smart cities. Enable will develop new technology to improve the way we manage our cities to benefit people, communities and the environment. Sensors and mobile devices will be linked in large, well-managed networks. The focus is on making better decisions from the data gathered, providing up-to-date information for people in towns and cities, while keeping personal data private and the networks secure. We aim to enable smarter transport services, reduce pollution, improve our work places and allow everybody to take part in the decisions.



→ The increasing availability of real-time information from a myriad of mobile and embedded sensors... combined with high bandwidth network connectivity, creates the potential for the deployment of innovative software services...

Trinity joins LERU

(League of European Research Universities)

In January 2017 Trinity College Dublin became the 23rd member of LERU (League of European Research Universities), a powerful EU research and education policy group whose prestigious members include the Universities of Oxford, Cambridge, Heidelberg, Paris—Sud, Zurich and KU Leuven.

Trinity is the only Irish university to be admitted, thanks to significant success with research, innovation and entrepreneurship (see Table 1) and it joins at a critical juncture for influencing the development of the research funding policy environment, both within the EU and nationally.

RIGHT (L–R) – Minister for Education and Skills, Richard Bruton, TD and Provost, Dr Patrick Prendergast at the announcement that Trinity has joined LERU



→ Trinity is the only Irish university to be admitted, thanks to significant success with research, innovation and entrepreneurship.

05

Table 1: Trinity's Research and Entrepreneurship Impact

RESEARCH FUNDING SECURED BY TRINITY FROM HORIZON 2020: **€65M (TO MAY 2017)**

TRINITY SUCCESS WITH HORIZON 2020 VIS-À-VIS OTHER EU HIGHER EDUCATION INSTITUTES: **25TH/1,434**¹

TRINITY SUCCESS WITH HORIZON 2020 VIS-À-VIS OTHER EU ORGANISATIONS: **38TH/17,075**

TRINITY SUCCESS WITH CREATING SPIN-OUT COMPANIES: **OVER 65 CAMPUS COMPANIES** FOUNDED SINCE 1985 HAVE SECURED **€195M OF PRIVATE INVESTMENT**

TRINITY SUCCESS IN PRODUCING VENTURE-BACKED ENTREPRENEURS FROM ITS UNDERGRADUATE PROGRAMMES: **1ST IN EUROPE (EVALUATED BY PITCHBOOK)**²

EU Research Funding

We are currently midway through the world's largest competitive public funding programme for research and innovation—the EU's Framework Programme 8/Horizon 2020, also known as FP8 or H2020, which counts an overall budget of €77 billion and is of particular importance against a backdrop of cut-backs in many member states' national research budgets. There is already intense lobbying around the budget and structure of the successor programme, FP9, due to launch in 2021, and there is pressure to prioritise funding for activities to bridge the European 'innovation gap'. This is where membership of LERU is proving vital.

LERU promotes the internationally competitive research partnerships between universities, industry and society, enabled by EU funding. It is a voice highly regarded by the European Commission, and lobbies for a balanced approach to funding—from fundamental research through to commercialisation—making the argument that frontier research is a bedrock of innovation. This is Trinity's position but single organisations and smaller member states cannot exact the same level of influence as larger countries and influential stakeholder organisations such as LERU.

Brexit

LERU provides a particularly strong platform for the sharing of information and articulating of views around the shape and delivery of future funding. This is particularly important in the context of Brexit. The UK has been a strong voice and ally for Ireland in Europe and has helped with shaping research policy in a mutually beneficial way. In the Framework Programmes, the UK is one of the most important research collaborators for Ireland and the most important one for Trinity. With UK influence likely diminishing over the period to their EU exit date, LERU—which is advocating that the UK continues to contribute to the European Research Area—provides a strong voice for Trinity (and Ireland). Membership of LERU will be critical in maintaining Trinity's and Ireland's—success in accessing funding in the next FP9 round, and in preventing undesirable outcomes from Brexit.

National funding

LERU also has significant potential influence on national funding because national and EU funding systems are hyper-connected: the 'Europe 2020' strategy sets a target of 3% of GDP to be invested in R&D in each member state so as to develop a European Research Area (ERA) in which researchers, scientific knowledge and technology can circulate freely.

¹ E-CORDA extraction date: 2017/02/28

² <https://pitchbook.com/news/reports/2017-universities-report>



Ireland's gross expenditure in R&D as a percentage of GDP has been falling since 2009 and is well below the EU-28 average.³

All Irish universities advocate for Ireland to meet the 3% GDP target of investment in R&D but as a LERU member, Trinity can draw on a particularly strong lobbying group. LERU is a strong advocate for the implementation of the ERA roadmap, which it believes helps progress necessary national reforms of the research ecosystem. LERU highlights that its research intensive members are hubs of creativity and have a catalytic effect on the economies of their regions.

LERU is currently calling for EU structural funding to be used in synergy nationally with FP funding to build up capacity across member states; this call is resonating in Europe. Put simply: to attract, support and retain the best researchers and to create a knowledge base for society requires cutting-edge infrastructure that can be enabled through structural funds. Trinity feeds the knowledge gained through LERU membership back to the Irish research environment via engagement with industry and with the educational sector in Ireland. In short, LERU understands the need to demonstrate impact so that politicians and the public appreciate that "Universities are key actors to build a knowledge-based society and to enable innovation in Europe".⁴

→ LERU promotes the internationally competitive research partnerships between universities, industry and society, enabled by EU funding.

³ DJEI, The Research and Development Budget (R&D) 2015-2016 and European Commission: European Research Area, Progress Report 2016, Country snapshot Ireland.

⁴ LERU advice paper No. 22-June 2017, Beyond the Horizon: LERU's view on the 9th Framework Programme for Research and Innovation.

Innovation and Enterprise

For the third year running, Trinity is ranked 1st in Europe for producing entrepreneurs, according to *The Universities Report* published September 2017 by private equity and venture-focused research firm, Pitchbook.

Trinity graduates have raised \$2.372 billion in funding across 201 companies in the last decade. This is a testament to the quality of a Trinity education, the competitiveness of the Dublin innovation ecosystem, and Trinity's role in enabling entrepreneurship talent.

Trinity is the only European university in Pitchbook's Top 50 for producing venture-backed entrepreneurs from its undergraduate programmes. Specific success stories over the past year include Inflazome, co-founded by Trinity alumnus and Professor in Biochemistry, Luke O'Neill, which raised €15 million in September 2017, and Plynk, a FinTech company co-founded by alumnus Charles Dowd, which raised €25 million in Series A funding in June 2017.

This year saw the appointment of Trinity's first Chief Innovation and Enterprise Officer, Dr Diarmuid O'Brien, who will coordinate and promote a culture of entrepreneurship in the University and head the future development of the technology campus, TTech, in Grand Canal Dock. Trinity interacts with 400+ industry partners annually, ranging from large-scale multi nationals such as Google to student start-ups such as iDly. In 2016/17, Trinity collaborated with multinational companies including Huawei, Intel, AbbVie, and ALU, and Irish SME's such as Ceramicx, Sigmoid Pharma and Ecocem Ireland. Trinity approved the formation of two new campus companies this year, Inflazome and Proverum, and in April, the Trinity Business School announced a new position: the Ryanair Professor of Entrepreneurship.

RIGHT – Raef Tyrrell, Kmla Sharma and Mark McGeough of Trinity Launchbox team Ekho



→ Trinity graduates have raised \$2.372 billion in funding across 201 companies in the last decade.

06



Endowed by the Ryanair Foundation, the new professorship will teach and research in the field of entrepreneurship and innovation at the Trinity Business School, and promote entrepreneurship across the University.

Trinity was successful in the SFI Industry fellowship programme calls for joint projects with companies including Aylien, Nokia Bell Labs, Trinity Green Energies, DePuy, Logitech, Transitions Optical Ltd and Glanbia. Irish funding agencies are increasingly promoting awards to complement or precede industry funded or co-funded collaborations. SFI research and IDA/EI technology centre awards represent significant state investments in industry collaborative research. With international peer review, they provide clear validation that Trinity research is world-class and directly impacts industry.

Staff Innovation

Trinity won two major prizes at the 2017 Knowledge Transfer Ireland Awards: the 'Initiative of the Year Award' for the University Bridge Fund, a joint collaboration with UCD, and the 'Collaborative Research Impact Award' along with Ceramicx Ireland Ltd. Trinity was nominated in two other categories, the 'Licence2Market Impact Award' with iDly Systems Ltd and the 'Mature Spin-out Company Impact Award' with Solvotrin Therapeutics.

Trinity and its researchers continue to excel in attracting EU funds for innovative research, securing over €65 million in project funding from Horizon 2020 between

2014 and June 2017. Trinity is ranked first in Ireland for success in Horizon 2020 funding and 25th in Europe across all higher education institutions.

CONNECT, the SFI Research Centre for Future Networks at Trinity, partnered with Smart Dublin - an initiative of Dublin City Council, other Dublin local authorities, and INTEL - to deploy low-cost sensors across the capital monitoring rainfall, weather conditions and river levels. The sensors will use CONNECT's Internet of Things network, 'Pervasive Nation', to provide authorities with an early warning of potential flooding.

AMBER, the SFI-funded materials science institute headquartered at Trinity, extended their partnership with Nokia Bell Labs into 2020 with a €1.1 million commitment. This includes a number of Nokia Bell Labs researchers-in-residence based at AMBER. SFI is contributing a further €1.2 million (bringing total collaboration to €2.3 million). The research focus is on novel energy storage technologies and advanced thermal management systems to enable extreme integration of optoelectronics devices.

Trinity spinout and healthcare company, Solvotrin, raised an additional \$8 million in financing and successfully launched 'Active Iron', an oral iron supplement in partnership with Boots Pharmacy in Ireland and the UK, with planned global sales including to Germany, China, Australia/NZ, and USA.

Trinity researchers led the development of a prototype social media monitoring system to aid disaster response, as

FAR LEFT – Trinity graduates, Talita Holzer Saad and Robbie Fryers, winners of the 2017 James Dyson award with Pat O’Shea and his son, Patrick in Front Square

→ Trinity and its researchers continue to excel in attracting EU funds for innovative research, securing over €65 million in project funding from Horizon 2020 between 2014 and June 2017.

well as a world-first model licence agreement. The *Slándáil Emergency Management System* aids emergency services and disaster response agencies to respond more rapidly, while the licence agreement can be used to pull data from social media.

Student Innovation

The hugely successful incubator programme LaunchBox, supported by Bank of Ireland has created 50 startups that have gone on to raise €6.1 million in investment since the programme’s inception in 2013.

Ten student-led start-up teams were selected for LaunchBox this year – benefitting from coaching, expert advice, seed funding and access to incubator space and facilities. Some of the teams – including *Equine Medirecord* and *Ekho*—have already moved on to next-stage entrepreneur development programmes and have kick-started operations with paying customers.

Equine MediRecord - an app aimed at resolving complications in documenting medical administration for racehorses - has received funding from Bank of Ireland, Naas Local Enterprise Office, and Enterprise Ireland and it won awards at the Dun Laoghaire Rathdown Chamber of Commerce Business Awards 2017 and the One Zero Startup Competition 2017, one of the largest sport-tech competitions in Europe. *Ekho*, which provides integrated solutions that decrease costs and increase visitor engagement for cultural sites, has been accepted into phase two of EI’s New Frontiers programme, and has signed its first pilot programme with Science Gallery Dublin and with Trinity.

LaunchBox is just one avenue through which Trinity students can nurture their entrepreneurial skills. The Blackstone LaunchPad campus entrepreneurship programme operates from the Berkeley Library, and fosters student entrepreneurs, connecting them with the startup ecosystem. Over 150 student startups have registered since LaunchPad opened in 2016 and more than 30 student startups have progressed on to early stage funding.

The Innovation Academy, an initiative of Trinity, UCD and Queen’s University Belfast, continues to offer innovation and entrepreneurial training to postgraduates. This year it conducted the first in a series of Postdoc Bootcamps to be rolled out over the next three years

Together with the School of Chemistry, the Innovation Academy was awarded substantial European funding for three new educational projects to start in 2018, under the European Institute of Innovation and Technology (EIT) Raw Materials KIC. The funding enables the Innovation Academy to provide 20 scholarships for Trinity’s Postgraduate Certificate in Innovation and Entrepreneurship, and to contribute to a pan-European Masters for Maintenance Engineering, led by Technische Universität Bergakademie Freiberg in Germany.

Engineering graduates, Talita Holzer Saad (26) and Robbie Fryers (24), won the Irish 2017 James Dyson Award for inventing a new software solution that helps people with intellectual disabilities navigate independently. *waytoB* is a smartphone and smartwatch solution allowing carers to pre-programme set routes which users can easily follow.

Trinity student Shauna Quinn and her team won a citizen science competition at the League of European Research Universities (LERU) Doctoral Summer School after proposing ‘Letswakeapp’, a project to select the right alarm tone on an individual basis so as to ensure a good wake-up experience.

Trinity student innovators, completing the 4E5 innovation module in engineering, joined with peers from Pontificia Universidad Javeriana (PUJ) in Colombia, the University of Sao Paulo in Brazil, and the Karlsruhe Institute of Technology in Germany to work on collaborative eight-month projects that paired them with industrial partners. The students showcased next-generation prototype vehicle and robotic solutions, delivering Dragons Den-style pitches in July to packed audiences of investors and industry partners.

Public Engagement

Engaging wider society is encapsulated in Trinity's mission and Strategic Plan, and happens on a number of different levels including organising public lectures and events, making research available online, media coverage, social media activity, and welcoming the public on campus.

The highly successful *Inside Trinity* documentary series trended on Twitter each night it aired on RTÉ in September and October 2016. Filmed throughout the 2015/16 academic year, the series offered a fascinating glimpse of a great Irish institution at work. The cameras captured the whole gamut of life: study, teaching and learning, research, sports and much more.

On-going annual synergies with national events include Trinity welcoming the public on campus for Culture Night, Open House Dublin, and Front façade lighting up green to celebrate St Patrick's Day, and red to welcome in the Chinese New Year in February.

'PROBE: Research Uncovered', a pop-up festival returned in September with a packed programme of talks, experiments, and interactive workshops showcasing the best of Irish research. In Front Square, over 3,000 visitors contributed to live research experiments and joined workshops dealing with a range of topics, from perception and intimacy to food security and global migration. PROBE, a collaboration between Trinity and Science Gallery Dublin, was part of European Researchers' Night, taking place in cities across the continent.

RIGHT – *The Volunteers* by Joe Caslin
commissioned as part of the Trinity
Creative Challenge

→ Sponsored by the Provost and unveiled in May 2015, the Trinity Creative Challenge award was established to catalyse the creative and cultural arts in Dublin city and to support the development of the creative and cultural industries.



07

→ The Centre for Women in Science & Engineering Research (WiSER) in February hosted Dr Catherine Vidal, a neurobiologist and global expert in the societal implications of sex and gender, for an intriguing public lecture which posed the question: Does the brain have a sex/gender?

Public lectures

The University hosts a range of public lectures organised by its research institutes, centres, and schools. Robert Fisk, award winning writer and journalist, delivered the annual Trinity Long Room Hub Edmund Burke Lecture on the theme of 'From the Frontline: An Eyewitness Account from the Middle East' in November.

In the same venue the following month, Professor Phillippe Sands of University College London delivered a public Lecture, 'East West Street: A personal take on the Origins of Genocide and Crimes against Humanity', in association with the Holocaust Education Trust Ireland.

The Faculty of Health Sciences hosted 2017's Trinity Week with a public programme of lectures, symposia and activities around the theme *Health in our Changing World: Discover, Understand, Act*. The Trinity Centre for Asian Studies hosted a series of public lectures as part of the Dublin Chinese New Year Festival. Each one tackled an aspect of China, related to the theme of the rooster.

The Centre for Women in Science & Engineering Research (WiSER) in February hosted Dr Catherine Vidal, a neurobiologist and global expert in the societal implications of sex and gender, for an intriguing public lecture which posed the question: Does the brain have a sex/gender?

Former Taoiseach, John Bruton spoke about the political consequences of Brexit at the annual Henry Grattan lecture in London. The lecture was hosted by the Embassy of Ireland in London in association with the School of Social Sciences and Philosophy.

To mark the centenary of the Irish Convention, Trinity hosted a two-day public symposium in July to examine the aims and legacy of the Convention. It opened with a round table discussion with two former Taoisigh, Bertie Ahern and John Bruton, as well as the Attorney General for Northern Ireland, John Larkin QC.

Looking at 'Culture and Populism: The Crisis of the Humanities and the Crisis of Western Liberalism,' Professor Joep Leerssen delivered the Trinity Long Room Hub's Annual Humanities Horizons Lecture in March.

The second *First Up* series of lunchtime talks from creative entrepreneurs on 'breaking through' took place between January and May 2017. *First Up* is a collaboration between Science Gallery Dublin and the Trinity Long Room Hub.

Also organised by the Trinity Long Room Hub, the 'Behind the Headlines' discussion series offers background analyses to current issues. Among the topics in 2016/17 were: 'Trump's America: 60 Days In', 'Abortion in Modern Ireland', 'Syria: The Local and the Global' and 'BREXIT, Brussels and the Big Apple'.

Former Taoiseach, John Bruton spoke about the political consequences of Brexit at the annual Henry Grattan lecture in London. The lecture was hosted by the Embassy of Ireland in London in association with the School of Social Sciences and Philosophy.

BELOW – *In Case of Emergency* exhibition
at Science Gallery Dublin



07



Exhibitions

The Long Room and Science Gallery Dublin provide Trinity with world class spaces for innovative public exhibitions. Four exhibitions were held in Science Gallery Dublin, curated by Trinity staff and guest curators: DESIGN AND VIOLENCE, HUMANS NEED NOT APPLY, SOUND CHECK and IN CASE OF EMERGENCY.

A digital exhibition, exploring JM Synge's most celebrated play - *The Playboy of the Western World* - was launched on its 110th anniversary. It was curated by the School of English, as a collaboration between Trinity's Library (which holds the collection of Synge's literary manuscripts) and the Google Cultural Institute.

Trinity marked the 350th anniversary of Jonathan Swift's birth this year with a display of books and manuscripts (including Swift's death mask) in the Long Room, an international conference, and a collaborative online exhibition drawing on artefacts relevant to Swift from Trinity, St Patrick's Cathedral, Marsh's Library, and St Patrick's Hospital. The Royal Irish Academy and the National Library also collaborated.

Marking the 50th anniversary of The Berkeley Library, a programme of events, beginning early 2017, invited the public to visit the Library and learn more of its remarkable beginnings and role at the heart of the University. The programme includes architectural tours, talks and the screening of the pioneering film 'Building for Books' shown in every cinema in Ireland in 1958 as part of a national fundraising campaign

for the new Library at the time. Architect, Paul Koralek, who originally designed the iconic modernist building, gave a public interview.

Precious Irish manuscripts from the Dark Ages have been conserved by Trinity following a three-year programme funded by Bank of America Merrill Lynch's global Art Conservation project. The rarely seen manuscripts from early Christianity have been repaired, analysed and digitised and went on public display together for the first time, unveiled by Trinity's Chancellor, Dr Mary Robinson, in June. The manuscripts are the *Codex Usserianus Primus*, the *Garland of Howth*, the *Book of Dimma*, and the *Book of Mulling*. They join the Book of Kells, the Book of Durrow and the Book of Armagh to form the preeminent collection of early Irish manuscripts in the world.

An exhibition on the life and work of Ellen Hutchins, the trailblazing young woman credited with being 'Ireland's first female botanist,' took place in the Old Anatomy Building, and the Ellen Hutchins Festival in Bantry, displaying Ellen's material from the Herbarium of Trinity's Botany department.

A unique exhibition on Japanese manga was on display in Trinity's Long Room Hub in March. The Japan Foundation international 'Manga Hokusai Manga' travelling exhibition introduced comparisons between contemporary Japanese manga comics and the 'Hokusai Manga', a collection of 15 volumes of sketches by Japanese artist Katsushika Hokusai (1760-1849), perhaps best known for his woodblock print, 'The Great Wave'.

LEFT (L-R) – Fei Huang, Chinese Embassy, Niall Gibbons, CEO of Tourism Ireland, Brendan Carr, Lord Mayor of Dublin, H.E. Dr Yue Xiaoyong, Chinese Ambassador to Ireland, and Prof Juliette Hussey, Vice-President for Global Relations

BELOW LEFT – Professor of Botany, Jane Stout with busy bees Emilie and Molly and Eoin Dillon

BELOW RIGHT – Participating in *PROBE: Research Uncovered*



The Reformation quincentenary (1517-2017) was marked in February with a two day theological symposium, organised by the Lutheran Church in Ireland and the Confederal School of Religions, Peace Studies and Theology and a travelling exhibition, the 'Reformation Installation'.

The Suas 8x8 Photographic Exhibition was displayed outside the Berkeley Library as part of a development-focused arts festival organised by Suas Educational Development with Suas Trinity, DU Amnesty and Trinity Global Development Society. The images focused on asylum seekers to spread awareness about their crisis.

Trinity continued its commitment to playing a leading role in helping to catalyse the creative and cultural arts in Dublin City. The Trinity Creative Challenge fosters the development of ambitious and innovative interdisciplinary projects and works. Five new innovative projects were showcased across the University campus from five awardees: Clare Lymer, Dead Centre, Genomic Gastronomy, Joe Caslin, and Adrien Tien and Richard Duckworth.

Joe Caslin's large-scale piece of artwork, installed in Front Square, was the first of a three-part series entitled 'The Volunteers' which aims to highlight the importance of volunteerism in some of the most pressing issues in Irish society including drug addiction, mental health, and direct provision.

Beyond the campus

A series of short films featuring people with an intellectual disability, specifically designed for people with ID were produced by the research team from the Intellectual Disability Supplement to the Irish Longitudinal Study on Ageing (IDS-TILDA). The films depict research findings on the complex and unique health and social challenges facing Ireland's population who are ageing with an intellectual disability, through the lens of those who directly experience the challenges.

'Queen Medb' was the winning entry of a competition to name the queen bee of Trinity's newly installed campus beehive. Her name was selected from hundreds of suggestions from people in over 20 different countries in response to a social media competition. Professor of Botany, Jane Stout won the British Ecological Society's Engagement Award as a leading 'ecologist who has bridged the gap between ecology and the public.' She is a leading partner in the development and implementation of the All-Ireland Pollinator Plan and spearheaded Trinity's Campus Pollinator Plan.

The Student Experience

Trinity attracts motivated, bright, and curious students and we are committed to providing an environment where they will develop and enhance these attributes further. We seek to expose them to ideas and experiences that will empower them to make impact for their professions and for the good of their communities and wider society.

It is our aim to educate students who have mastered the intellectual and creative challenges of their degree, who understand the value of supportive networks and are willing to use their talents and leadership to make a positive lasting difference on the communities in which they live. This vision for them is at the core of the Trinity Student Experience.

This experience is delivered through the rigour of the academic programmes, but also through the richness and diversity of the experiences and networks developed in co and extra-curricular activities. The real strength of these activities (sports clubs, societies, volunteering) is that they are student-led, reflecting the passions and interests of the students themselves and allowing them to achieve and recognize benefits to themselves and others outside the academic sphere. Students involved in at least one activity outside the classroom are happier, better-adjusted, enjoy college life more, create broader networks of friends, perform better academically, and are better prepared for life after graduation.

The Dean of Students champions the student experience, integrating the out-of-class activities of students with the academic mission of the University to ensure that the years in Trinity provide students with unlimited opportunities for involvement, leadership, and personal exploration.

→ Students involved in at least one activity outside the classroom are happier, better—adjusted, enjoy college life more, create broader networks of friends, perform better academically, and are better prepared for life after graduation.



08



Student Societies

This year Trinity offered 121 student societies and 48 sports clubs, with three new societies launching—Space, Agriculture and TedX. As every year, Freshers Week showcased the huge diversity of Trinity clubs and societies including political, musical, cultural, volunteering and professional as well as plain fun and entertainment. It was followed by a very successful ‘Fourth Week’ at the end of October that allows the entire College community to try out societies they may have missed joining.

International guests are a feature of many societies—including notably the Hist, the Phil, the Law Society and SOFIA. This year ambassadors from the US, Switzerland, Egypt, Italy, and Korea addressed students while politicians Nick Clegg, the former deputy prime minister of the UK and Pat Cox, former President of the European Parliament, spoke to the Hist, as did the American singer-songwriter and activist Patti Smith. The Law Society presented its *Proeses Elit* Award to the former South African President, F.W. De Klerk, who spoke eloquently on the importance of defending the ideals of freedom and equality, particularly in the light of political developments in 2016.

The Orchestral Society performed their David Bowie set at Electric Picnic in September 2016 and reprised the performance in the Exam Hall for staff and students.

At the 2017 Student Achievement Awards Ireland, Trinity organisations and individuals won in eight of the 17 categories. Individual awards went to:

- Niall Cooke (Part-time Officer of the Year)
- Cyndi Lou (International Student of the Year)
- Carly Bailey (Mature Student of the Year)
- Dale Whelehan & Glen Byrne (Students Rights Champions of the Year)
- Niamh Herbert & Laura Beston (Activists of the Year)
- Sinead Baker (Journalist of the Year).

The University Times won Publication of the Year while Cumann Gaelach and AML Coláiste na Tríonóide won the Feachtas Gaeilge na Bliana (Irish Language Campaign of the Year) award.

Volunteering

This year the Dean’s Roll of Honour recognized one outstanding student for the Trinity Legacy Award for Volunteering, 30 students for the Dean of Students Leadership Award for Volunteering, and 62 for the 2017 Dean’s List. The Legacy Award went to Andrew Murphy who has played a fundamental role in societies such as the Philosophical Society, DU Photographic Society, Visual Arts Society and the Trinity Arts Festival and has held

LEFT – Dean’s Roll of Honour recipients with the Dean of Students, Prof Kevin O’Kelly and Sinéad Burke, PhD Candidate, School of Education who presented the awards

BELOW LEFT – Trinity Orchestra perform at *Electric Picnic* (Photo: Sam McAllister, Instagram sam.travel)

BELOW RIGHT – Trinity Space Society was launched this year



the position of executive member of the Central Societies Committee. Andrew spoke memorably of the impact that his extracurricular activities have had on his personal and career development:

“During a recent interview process, throughout the entire competency based interview, I was continually bringing up cases from my time in societies, more so than some of the challenges I faced during my academic studies. There is no doubt in my mind that the experience I received in extracurricular life in Trinity College has placed me on my current career trajectory.”

Evidence of this is apparent—he was one of eight selected from a pool of over 900 to join the International Enterprise Ireland Team.

As always, volunteering and fundraising showcased the generosity and outward focus of Trinity students. FLAC raised over €5,000 for the Peter McVerry Trust on the annual ‘Sleep-Out’ and Raise and Give (RAG) week was again a great success. Organised by the Students’ Union and Trinity Volunteering, it supported over a dozen charities and volunteering groups, including ten student-run charities as well as the Trinity Access Programme and the Student and Postgraduate Hardship funds.

Student Spaces

A campus-wide network of student spaces, ‘Zón Mac Léinn’, was launched with the opening of two new Student Spaces in Spring, one in the Arts Building and one in the Hamilton Building. Additional spaces in St James’s and Tallaght hospitals and D’Olier Street are underway. Spearheaded by the Student Life Committee and the Students’ Union, they are rooms designed and organized by students for students. They are spaces for students to hang out and relax and follow a decision of the Student Life Committee in 2015 to create more student spaces. In addition, a nap /respite room for students was opened in Goldsmith Hall to promote wellbeing and mental health.

“... I was continually bringing up cases from my time in societies, more so than some of the challenges I faced during my academic studies. There is no doubt in my mind that the experience I received in extracurricular life in Trinity College has placed me on my current career trajectory.”

Opening Access to Education

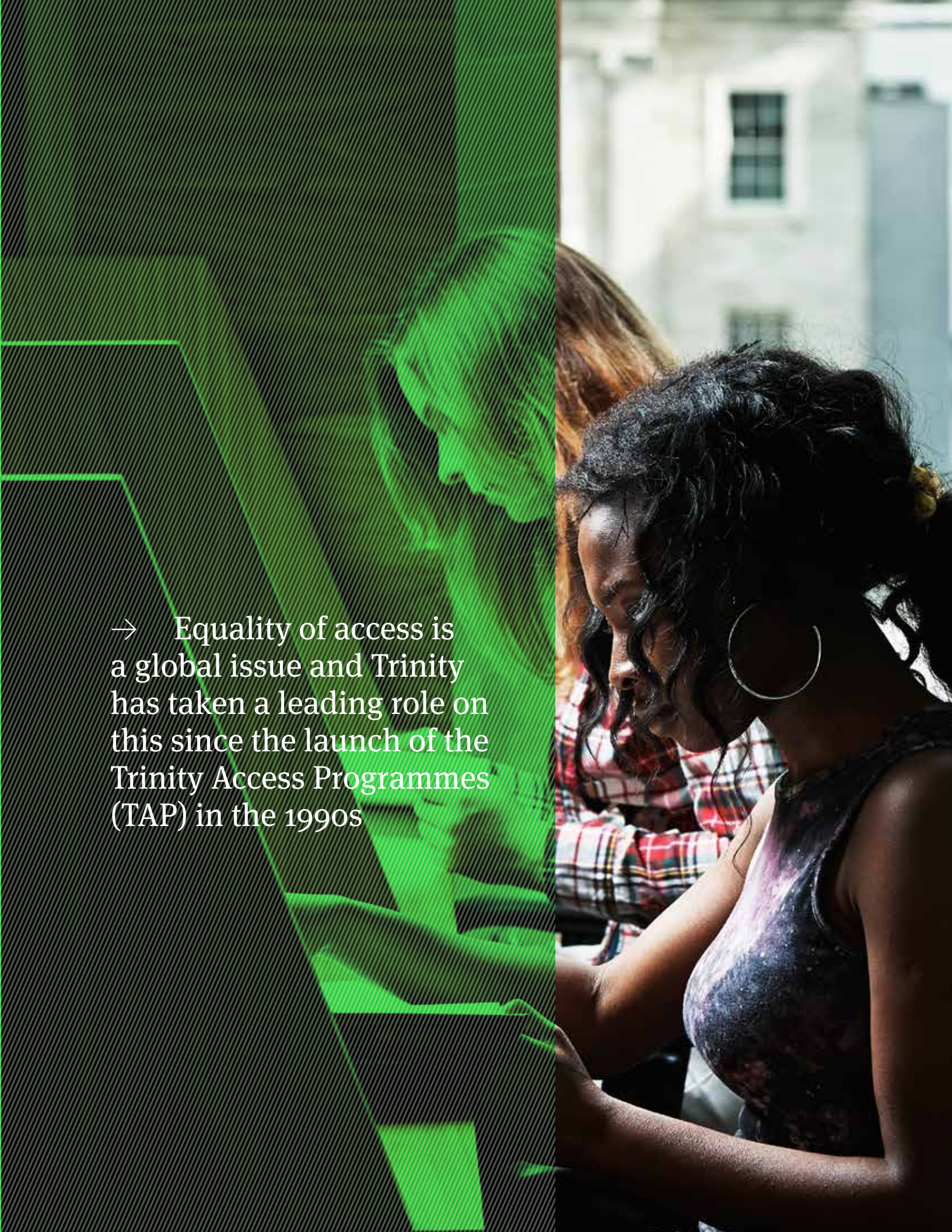
The opportunity to lead a rewarding life, fulfil your potential, and contribute to society starts with the opportunity to participate in higher education.

And yet millions around the world are denied this opportunity, and across most OECD countries, access (and graduation) rates between low-income and upper-income students are actually widening. In some of the world's top-ranked institutions, students from low-income backgrounds now account for just one in twenty enrolments.

Equality of access is a global issue and Trinity has taken a leading role on this since the launch of the Trinity Access Programmes (TAP) in the 1990s – pioneering programmes which have successfully challenged thinking about who can survive and thrive in our best universities.

Since the start of the millennium, over 2,000 students from low income communities have progressed to Trinity, with many demonstrating high academic attainment, particularly in the latter half of their degree course. In 2016, 268 students entered Junior Fresh year through alternative entry routes established by TAP. Strikingly, both the progression and the completion rate for TAP students in 2016/17 was 91%.

Trinity is currently spearheading three on-going innovations which are resulting in a deepening and widening of the Trinity Access Programmes, so that they reach more people, both nationally and internationally.



→ Equality of access is a global issue and Trinity has taken a leading role on this since the launch of the Trinity Access Programmes (TAP) in the 1990s

09



TOP LEFT – TAP summer school participants

BELOW LEFT – College Awareness Week launch

BOTTOM LEFT – TAP summer school participants

BOTTOM RIGHT – TAP Foundation Course for Higher Education graduation, June 2017 with Joe Duffy as guest speaker

→ Each student who progresses through to graduation changes their own story, changes the University's story, and changes the stories told within their own schools and communities.

The Trinity Access 21 project (TA21), developed in 2014-17 with support from Google, impacts on educational disadvantage and supports post-secondary educational progression by partnering with schools to develop strong 'college going cultures' and innovative approaches to teaching and learning through the use of four 'core practices': Pathways to College, Mentoring, Leadership through Service and 21C Teaching & Learning. The aim of TA21 is to build capacity within partner schools so that all students are informed and prepared to make post-secondary educational choices which will support them to realise their full educational potential.

In 2014-17, the TA21 project carried out a longitudinal, action research project which has tracked the educational outcomes of 1,100 students in 11 Trinity Access Programme (TAP) linked schools. This evidence base has revealed the positive impact that TA21 has had upon whole school culture - increasing college-going aspirations in students, and supporting the increased use of innovative, project-based teaching practices within the classroom. Based on this evidence, the project is now poised to scale nationally in TA21 Phase 2; expanding its reach and range of partnerships across other communities in the 2017-20 period. This growth phase has been supported by a range of companies and individuals, in partnership with the government, through the Social Innovation Fund Ireland Education Fund.

Spearheaded by TAP in 2014, **College Awareness Week (CAW)** is now the largest public awareness campaign in Ireland focusing on the benefits of a post-secondary education. With the involvement of 225,000 participants over the last three years, the campaign is a firm fixture in the calendars of formal and informal education providers. In November 2016, there were over 1,200 events logged on the website. These events took place in 26 counties and were delivered by pre-schools, primary, second level schools, adult and community education centres, libraries, and businesses, Further Education and Training Centres and higher education

institutions. Trinity took a whole-campus approach to CAW, with over 18 events across campus. The campaign has been supported by philanthropic and state sources for the last three years.

Foundation Year in Lady Margaret Hall

In 2016 Trinity hosted a delegation from Lady Margaret Hall, Oxford University to showcase the impact of the Trinity Access Programmes. This has developed into a partnership for a four-year project, adapting the TAP Foundation Course to the context in Oxford University. (The TAP Foundation Course is a one-year academic, social and personal course to prepare students to progress to college. Launched in the late 1990s, it was the catalyst for Trinity to precipitate, with other Irish higher education institutes, the development of a national scheme, operated through the CAO: the Higher Education Access Route (www.accesscollege.ie), which has admitted over 20,000 students nationwide since 2012).

The first course cohort, entering in September 2016, has now completed their Foundation Year in Lady Margaret Hall, and 70% of the group are progressing to Oxford University, with the remaining 30% progressing to other selective higher education institutions. Among the second Foundation Year cohort, which began in September 2017, are some extraordinary young people, including a self-taught young mathematician from Afghanistan, who arrived in the UK five years ago, and a gifted young creative writer from the UK care system.

Success for the Trinity Access Programmes is multi-layered - beginning with the student and extending to systemic change. Each student who progresses through to graduation changes their own story, changes the University's story, and changes the stories told within their own schools and communities. These stories become the next generation's realities. With the help of our partners in education, government, business and philanthropy, Trinity looks forward to helping to create many more such stories, nationally and internationally.

Developing the Campus

Trinity has a unique and remarkable residential campus in the heart of the city. Since the foundation of the College in 1592 the campus has continuously evolved to meet the needs of an expanding student and staff body and a developing curriculum, and to deliver on new requirements for college life.

Building, renovation and reconstruction to house new academic activity and support student life are the most obvious signs of campus development, but energy management and sustainability are also key, if less visible, initiatives. They are important objectives within the current Strategic Plan, which includes investments in lighting and heating upgrades to reduce the carbon footprint and energy consumption in the University.

Projects completed in 2016/17 include:

- the redecoration of the Examination Hall;
- the replacement of the bay windows in Goldsmith Hall;
- gym refurbishment;
- the creation of innovative new space for the Global Brain Health Institute in the Lloyd building
- refurbishment of student accommodation in older buildings;
- a major refurbishment of ‘Stack B’ – a building adjacent to CHQ in George’s Dock. This modern collaborative space now brings together the Electronic & Electrical Engineering department and the GV2, *SigMedia* research groups to create the Trinity Centre for Creative Technologies & Media Engineering (CHIME);
- an inter-professional simulation suite in St James’s hospital;
- Refurbishments to the Nassau Street entrance and to Regent House, improving the staff, student and visitor experience;
- The renovation of Regent House, including recovering the stone floor and installing a lift that also serves House 5;
- Remodelling spaces within the Arts Building and the Hamilton Building to create purposeful student spaces;

RIGHT (L-R) – Minister Richard Bruton TD and Provost Dr Patrick Prendergast turning the sod for the Trinity Business School



→ Building, renovation and reconstruction to house new academic activity and support student life are the most obvious signs of campus development, but energy management and sustainability are also key, if less visible, initiatives.

10



- Campus Pollination Plan - hives and bee hotels introduced on campus including on the roof of Parsons building.

Current Projects

There is currently a significant capital development programme underway, including:

- The new €80 million Trinity Business School, designed by Scott Tallon Walker architects, is due to be completed by the end of 2018. This project comprises six floors of teaching and research space, including an Innovation & Entrepreneurship Hub, a 600-seat auditorium and a College Boardroom. It includes the restoration of six terraced houses on Pearse Street for residential accommodation and new catering facilities.
- An essential upgrade to the medium voltage electrical work is due for completion in January 2018. This will replace an ageing system and allow the University to increase its maximum import by nearly 25%, providing power for future research, student and innovation activity.
- The Printing House Square project, on the former Oisín House site, comprising 250 new student bedrooms along with a new health unit, disability services and sports facilities has been designed by McCullough Mulvin architects, with project completion envisaged for August 2019.
- Outdoor sports facilities have been enhanced by the provision of additional all-weather sports facilities at Santry, with further developments planned in a later phase.

Trinity's in-house conservation architecture team led on the restoration of the organ in the 1785 Sir William Chambers-designed Examination Hall. This is the oldest Irish-made organ case, dating from approximately 1680, and it came from the original chapel. The organ was temporarily removed and sent to the UK for careful restoration and returned to an altered Examination Hall balcony to once again provide the familiar hair-raising acoustic backdrop to events.

Projects in the Planning Phase

- The E3 Learning Foundry on the site of the former Biochemistry building, comprising 5,000sq.m. of modern space for collaborative, project-based and informal learning. This project will focus on softening and reimagining the hard urban characteristic of the east end of the campus. While the Learning Foundry will provide the teaching space for the E3 community, the E3 Research Institute will be the anchor tenant for the campus at Grand Canal Dock - master-planning for that 5.5 acre site commenced in autumn 2017.
- Proposed refurbishment of student spaces in the Arts Building over the 2018 and 2019 summer periods to create collaboration spaces and a refreshing of public spaces.

With an eye to a 50-year future, Trinity is developing an estates strategy for the University, which will prepare the ground for a major master plan for the campus, including establishing needs and standards and setting a framework for sustainable capital infrastructure development.

LEFT – Redecoration of the Examination Hall

BELOW – Trinity Business School
— artist impression



Trinity Sport — Raising Our Game

Sport is central to Trinity, as a social, health and recreation activity for thousands of students and staff. It also provides a competitive platform for our high—performance athletes.

These two key themes, participation and performance, form the cornerstone of the current strategy for sport, 'Raising our Game' 2015–2018, which this year reached its half-way point.

This milestone was marked with an interim review, which highlighted that many of the goals set out in the original plan have been achieved ahead of time. Significant progress made thus far includes:

- Completion of phase 1 of outdoor sports facilities, fitness theatre extension and acquisition of the Iveagh Grounds. When fully operational this 17-acre site will provide a suite of all-weather flood-lit training facilities;
- The creation of a sports development unit which provides a clear pathway to ensure student sports clubs continue to flourish;
- A more streamlined staffing structure to realign with strategic goals.

RIGHT – Performance is one of Trinity Sport's key strategic themes

→ One of the two key strategic themes of 'Raising our Game' is participation, and an expanded social sport programme certainly captured the imagination of staff and students...



Trinity
College
Dublin

11



Social Sport & Participation

One of the two key strategic themes of 'Raising our Game' is participation, and an expanded social sport programme certainly captured the imagination of staff and students in 2016–2017, increasing participation levels along the way.

In addition to five-a-side soccer, dodgeball, tag rugby and badminton, this year also saw the introduction of successful 'learn to play' hockey and GAA courses as well as 3 v 3 basketball. Trinity Sport's recreational runs, the Reindeer Run, and Campus 5k are as popular as ever and continue to attract capacity crowds.

A newly introduced weekly social walk/run began as a pilot programme and was quickly extended into a permanent fixture. An ultimate frisbee social league for staff, new adult fencing and children's trampolining were among the other new additions to the classes and courses programmes.

High Performance

Our hockey ladies first XI had a well-earned promotion to the top-tier EY league while Trinity Rugby consolidated their position in division 1A of the AIL. The latter also saw four of their players called up to the Ireland U20 squad: Colm Hogan, Jack Kelly, Michael Silvester and Charlie Connolly.

Other student clubs that shone include sailing, who enjoyed one of their most successful years in decades, claiming colours and intervarsities. The latter was particularly sweet,

as it was their first in 11 years and it also resulted in an invitation to compete in the British University Sailing Association (BUSA) competition in Liverpool.

There were intervarsity wins too for the kayak club, ultimate frisbee, judo, squash, snow sports (who also won colours this year), and men's tennis.

Our fencers notched up their 10th consecutive intervarsities win to complete their 'decade of dominance'. An even more epic landmark was reached by the cricket club in June, who celebrated their 1,000th game since the formation of the Leinster league.

Trinity's senior hurlers competed in the prestigious Fitzgibbon Cup for the first time in over a decade. The team also made the final of the Kehoe Cup. Our freshers, meanwhile, completed the double to win both the league and championship in division 2. Fresher hurler Cian O'Sullivan was also called up to the Dublin senior squad.

Women's rugby welcomed the Women's Rugby World Cup to campus in March. The event was hosted by Trinity captain Niamh Byrne, of Leinster and Ireland Sevens, and also saw the return of World Cup squad member and graduate Ailis Egan, who began playing her rugby at Trinity.

DUBC, who won the novice 8 Dan Quinn shield at this year's colours for the fourth consecutive year, look forward to welcoming their new chief rowing coach, Richard Ruggieri. Richard is a former head coach for the US U23 national team.

LEFT – The Campus 5k attracted a capacity crowd again this year

TOP RIGHT – Trinity women's rugby captain and sports scholar Niamh Byrne (left) and fellow scholar Kathryn-Ann Dane welcome the Women's Rugby World Cup to Trinity

BELOW RIGHT – Fresher hurler and Sports Person of the Year Cian O'Sullivan (left) in action for Trinity

BOTTOM RIGHT – There was great community engagement around the official GAA pitch launch at Santry, attended by GAA President Aogán Ó Fearghaíl

DULBC's novice 8 won at this year's Trinity Regatta, while two of the club's senior members, Caoimhe Dempsey and Aoife Corcoran, were selected to represent Ireland at the Home Internationals in Scotland.

Student Scholarships and Awards

Trinity Sport awarded 68 scholarships in 20 different sporting codes. Supported by Bank of Ireland, some of these recipients included:

- Ellen Ince, a two-time European champion as well as a two-time world champion in taekwondo.
- Áine Haberlin, Aisling Reynolds and Michelle Peel, all senior inter-county Gaelic football players.
- Irish U20 rugby players Colm Hogan, Jack Kelly and Michael Silvester.
- Women's rugby interprovincial players Kathryn-Ann Dane and Niamh Byrne.
- Commonwealth Games athlete Victoria Mullin.
- Prakash Vijayanath, South African international badminton player.
- Fencer Philip Cripwell, ranked number one in Ireland in both junior and senior foil (2015–16).
- Ireland Wolves cricket player Lorcan Tucker, who also helped Ireland retain the Hone Mac-Gregor Trophy at this year's Irish Universities Cricket tournament in Cambridge.

The annual sport awards and commons was once again compered by RTE presenter Evanne Ní Chuilínn and was attended by special guests Ed Joyce and Rob Kearney. There were eight awards in total, including Club of the Year (fencing), Team of the Year (ladies hockey first XI) and Sports Person of the Year (Cian O'Sullivan – hurling).

Facilities

For the third consecutive year the Sports Centre won Gold in the White Flag National Quality Standards, which grades facilities for their operational standards. This year was the Centre's 10th anniversary since its founding and it underwent a major reconfiguration and enhancement programme.

The completion of phase 1 works at Santry Sports Grounds was heralded with pomp and ceremony when the GAA pitch was officially launched with a match between Jim Gavin's Dublin team and a Trinity selection. It was great too to welcome GAA President Aogán Ó Fearghaíl to this event.

The pending acquisition of the 17-acre Iveagh Sports Grounds will provide enhanced GAA, rugby and hockey facilities.

As Trinity Sport continues to build on previous successes, it enters into the final stage of its strategic plan in good shape.



New Professor Interviews

01 Professor Aljosa Smolic

02 Professor Eiléan Ní Chuilleanáin

03 Professor Rhodri Cusack



12 Professor Aljosa Smolic

SFI Research
Professor of Creative Technologies

→ During his seven years in Zurich, he led over 50 industrial R&D projects resulting in technology transfers to a range of Disney business units. “I worked a lot with TV and live action – we did post–production and created plug-ins for professional production software.”

“We have Augmented Reality in our hands right now with the latest iOS phone, so interest is about to explode and we’ll see a lot of apps coming out this year, as well as enabling devices like headsets and glasses. Tim Cook, CEO of Apple, has said that Augmented Reality is a big idea, like the smartphone so that gives you an idea of the scale of it.”

Professor Aljosa Smolic, the inaugural SFI Research Professor of Creative Technologies in Trinity’s School of Computer Science and Statistics, is talking about his cutting-edge research and how he and his team are contributing to the next big thing in technology.

He explains Augmented Reality (AR) for the lay person: “It’s the integration of virtual and real-world elements. AR enhances your perception of reality through adding computer-generated or extracted sensory input like sound, video, or graphics. *Pokémon Go* was the first big experience of AR for lots of people and its success is an indicator of how popular this will be. It’s not all entertainment – AR has applications for industrial design, for architecture, navigation, health – you’ll be able to visualise your medical data on your phone.”

His team works on the algorithms and maths behind AR: “We process the visual info that operates on pixels – so everything that happens in between capturing an image and displaying it.” These algorithms can be used by diverse industries but his team is also looking for applications – “down the line we’ll be partnering with companies to commercialise our ideas.”

To showcase their research, they recently teamed up with Trinity’s Department of Drama, School of Creative Arts for a production of Samuel Beckett’s *Play*. “Using several cameras from different angles, we captured three actors on stage in green screen and then converted this into something the audience can visualise in 3D, with a head-set.”

Play was shown in Front Square for the Probe Science Night at the end of September and during the Dublin Theatre Festival in October. Another project he’s working on is with the Library: “We’re going to create an app where you can visit a part of the Library, and be immersed within it – it won’t be just visualisation, there will be a dynamic element, with maybe an actor.”

Professor Smolic has only been in Dublin a year, and most of his time has been spent designing lectures and courses within the School of Computer Science and Statistics, and putting together his research team. Creative Technologies is a new professorship within Trinity. “My SFI grant allows me to finance over 20 researchers, to create a group. We’ve finally got the whole team together, it’s very international, we have projects running and we’re getting out publications and prototypes.”

He comes to Dublin from Zurich where he was Senior Research Scientist and Head of the Advanced Video Technology Group in Disney Research Zurich. “Disney founded two research labs in 2008,” he explains, “one in Pittsburgh and one in Zurich.”



12

“The driving force for this was the success of Pixar, which was this brilliant combination of art and technology, animators working with computer scientists. Disney had been buying in technology, but they realised the game-change and they acquired Pixar and set up their own research labs.”

During his seven years in Zurich, he led over 50 industrial R&D projects resulting in technology transfers to a range of Disney business units. “I worked a lot with TV and live action – we did post-production and created plug-ins for professional production software.”

He enjoyed his time there, but having come from an academic background - scientific project manager with the Fraunhofer Heinrich-Hertz-Institut (HHI) in Berlin – he wanted to return fully to research, without ties of company needs, and to connect with students. “The SFI professorship was very attractive, and of course I’m delighted to be in Dublin and Trinity - although things have been so busy, the most time I’ve had to explore the city is my weekly run along the coast.”

Trinity is the latest development on a career path which, he says, “has never been linear”. Born in Austria, then lived briefly in Croatia, before moving with his family to Germany when he was three. At that time, the Wall was still up: “I grew up in West Berlin, which was like an island in the East. It was a very interesting environment - a lot of alternative people and a great music scene, David Bowie lived there for a while. But to get out of the city, you had to take a train for three hours. From my bedroom window I could see over the Wall to a forest, which I couldn’t get to.”

When he was twenty, the Wall came down and he could finally walk in the forest. By this time, he was a student at the Technical University, TU Berlin, “looking for a subject to study”. At school, he liked everything – “from philosophy to physics, all subjects, and I was playing in a number of bands hip-hop, grunge, folk.” At TU Berlin, he tried out studying philosophy, psychology, and biology, and outside class he was using the latest computer technology to record audio signals for his band. “It was maybe a bit disorienting to be interested in so many things. Then I found out that at TU Berlin you could study audio engineering and signal processing.”

This turned out to be the perfect discipline for him. He got more into the maths and physics of it and when he applied for a job in the Fraunhofer Institute, he moved from audio processing to image processing, which remains his field today.

With all the big players investing heavily in AR, it’s about to explode. Professor Smolic is in the dynamic position of having grown up with the industry – “I’ve been putting virtual and real things together, reconstructing real-world environments, for 15 years” – and his diversity of interests, including in philosophy and psychology, gives him a broad outlook.

“Where might AR and virtual reality take us? Will we get into the Matrix – with people becoming junkies for the virtual world, leaving the real world? Yes, I’m interested in all that. Trinity is such a multidisciplinary environment – this could be a great place for engineers, computer scientists, philosophers, psychologists, neuroscientists to look at such questions of human behaviour which are going to be critical for the future.”

Professor Eiléan Ní Chuilleanáin

Ireland Professor of Poetry

→ “A really serious use of language is a public good. Not using language in foolish and inappropriate and inaccurate ways is something that everyone should learn. We need to know the things that language can do and studying literature is one of the ways to find that out.”

“It’s a little unusual because I’m in Trinity anyway. I’m retired from teaching but as a Fellow I’m entitled to have some space as long as I’m doing work, and the Oscar Wilde Centre gave me an office at the top of Westland Row, which I use. So I’ll be coming back in a new role, but it won’t all be new to me.”

Eiléan Ní Chuilleanáin is talking about her ‘return’ to Trinity in early 2018, when as Ireland Professor of Poetry she will spend the Hilary term in college, working with students and giving informal readings and seminars, as well as a formal lecture.

She is the seventh Ireland Professor of Poetry since the chair was set up in 1998. It is jointly held between Queen’s University Belfast, Trinity College Dublin, University College Dublin, the Arts Council of Northern Ireland and the Arts Council/An Chomhairle Ealaíon.

The chair is held for three years with the incumbent spending a year attached to each of the universities and residing for a period of approximately eight weeks at each.

Professor Ní Chuilleanáin, who was appointed in May 2016, spent last academic year attached to Queen’s University Belfast; now it’s Trinity’s turn and from January to April she will be poet-in-residence on campus.

As she says, this makes for a somewhat unusual situation because unlike the previous six Ireland Professors of Poetry—including Michael Longley, Paul Durcan and

Paula Meehan—hers is already a familiar presence on campus. She was a member of Trinity’s faculty in the School of English for half a century, having been appointed to a junior lectureship in 1965, at the precocious age of 23.

She brings great distinction to the Ireland Chair—as a poet, scholar, editor and advocate for poetry. On her appointment the *Irish Times* noted: “Her sometimes elusive poems have an unmistakable beauty, elegance and grace that carries readers into their own special world of image and feeling. She moves at ease between Irish and European landscapes, between the material and the spiritual realms, unifying them by the force of her compelling imagination.

“She has been an important advocate and spokesperson for poetry, both as an editor of the long-running journal, *Cyphers*, which she helped to found, and in her outreach activities.”

As an award-winning poet and distinguished academic, she is well-prepared for many of the responsibilities of the Ireland Chair but interestingly, the one area that is relatively new to her is mentoring students of creative writing.

“I went through almost fifty years in academia without teaching creative writing. I’ve occasionally tried to give workshops when I was asked and I came to the conclusion that I was not good at it, because I’m very critical and that is not what you need starting out.”

12

She makes a nice distinction: “I’m not sure it’s possible to *teach* writing, but I am quite sure it’s possible to *learn* it... I’m sure students who take these courses learn as much from each other as from the teachers. Being part of a group of people who are all writing is terribly useful, and having a few strange, elderly people dotted around the place is probably quite useful also.”

This is amusingly self-deprecating, but there’s no doubt that her dedication to poetry and attention to the craft must inspire students.

She knew she wanted to be a poet from an early age. Her background was scholarly and literary—her father, Cormac Ó Cuilleain was professor of Irish in UCC; her mother Eilis Dillon was a writer of children’s books; her great-uncle was the 1916 signatory, Joseph Mary Plunkett. She says that Irish “was probably chronologically my first language. My mother wrote three books in Irish, then started writing in English.” She herself writes mainly in English, but has always written a little in Irish.

Aged 23, not having yet finished her B.Litt in Oxford, she was recruited by Trinity. She was, she says, lucky—“Trinity was then expanding rapidly, as indeed were universities in Britain like Keele and Sussex, and it was a good time for getting a job.”

Trinity was impressed by her academic record in UCC and Oxford, but also by her creative writing. “I had just won the *Irish Times* prize for poetry. You had to submit pseudonymously to that Prize and for the first and last time in my life, I used a male pseudonym.”

In Trinity she became an expert on Renaissance literature and continued developing as a poet by ploughing her own furrow: “When I was starting out, there was a feeling that women weren’t able to write big, intellectual subjects. That was Phase One. And then with the women’s movement, it turned the other way—they *only* wanted women to write about personal subjects. I was a bit resistant to that—someone said that when everyone else was writing about gynaecology, I was writing about nuns. At one point I was thought to be very obscure but then along came Medbh McGuckian, and all of a sudden people found that I wasn’t that obscure!”

There were no creative writing classes when she was starting out, and like many of her generation “I learnt my trade in the pub.” She was part of a dynamic generation of writers including Michael Hartnett and Macdara Woods, who became her husband, and she speaks fondly of the older writers who became friends and mentors, especially Leland Bardwell and Pearse Hutchinson.

“Pearse Hutchinson was fifteen years older than me and he was interested in younger writers. He spoke many languages and was a great translator. I never tried to write like him but somehow his presence, I later saw, was very important to me. He was very well read in the literature of European languages. I *thought* I was well read.”

It was perhaps Hutchinson’s influence that encouraged her own work in translation—she translates from Irish, Italian and Romanian and in 2005 she co-founded the Masters in Literary Translation, which is now run from Trinity’s Centre of Literary Translation, CLT. Last year, as Ireland Professor of Poetry in Queen’s University Belfast, she gave a seminar on translation.

At 74, she retains a radiant energy, a deep interest in other cultures, and a belief in language. She gives a brilliant justification for the study of literature: “A really serious use of language is a public good. Not using language in foolish and inappropriate and inaccurate ways is something that everyone should learn. We need to know the things that language can do and studying literature is one of the ways to find that out.”

For younger poets she has simple advice: “Keep writing, keep reading. The big difference between poets who are going to have some kind of impact and the rest in the next ten years or twenty years is how much they’re reading. I gave a lecture on Seamus Heaney in Hungary and I was reading the *Stepping Stones* interviews—and the breadth and ease of reference there; here’s someone who was always reading and was always reading the way a poet reads—for interest, for markers, for how could you do that differently, for technique, for all those things.”



12

Professor Rhodri CusackThomas Mitchell Professor of Cognitive Neuroscience

→ “My research has two goals: to understand how our brains develop and when different cognitive functions emerge; and to understand how perinatal brain injury affects development. Many babies who acquire brain injury – from a difficult birth or complications following prematurity – develop typically, but other babies don’t, and currently we don’t know why. The approach at the moment is often to ‘wait-and-see’ what problems emerge during childhood – this is stressful for parents and means we’re not intervening early to optimise treatment.”

“If you wait till the child is two and a half years old, when the first problems with language might manifest, you will have missed opportunities for early intervention. If we understand what normal development should look like from birth, we’ll be able to detect much earlier when things are going wrong, and intervene earlier.”

Professor Rhodri Cusack, newly appointed Thomas Mitchell Professor of Cognitive Neuroscience in the School of Psychology, is talking about his research in the frontier field of infant neuroscience.

“My research has two goals: to understand how our brains develop and when different cognitive functions emerge; and to understand how perinatal brain injury affects development. Many babies who acquire brain injury—from a difficult birth or complications following prematurity—develop typically, but other babies don’t, and currently we don’t know why. The approach at the moment is often to ‘wait-and-see’ what problems emerge during childhood—this is stressful for parents and means we’re not intervening early to optimise treatment.”

Babies can’t of course talk to tell you what’s wrong, and until six months they can’t even sit up. Thanks to pioneering studies of infant behaviour we know something about how they should be developing but a real breakthrough is now being made with neuroimaging. This is the bedrock of Professor Cusack’s research: “With MRI [magnetic resonance imaging] we can study brain networks of babies from birth. We scan them asleep and awake. If they’re awake we keep them interested with toys, sounds, images and we study what’s happening in their brains when they respond to things.”

This has all kinds of exciting potential for application—from neonatal care for preterm babies to government childcare programmes. “In the US, for instance, they have a programme, Early Headstart, which provides day care for the first two years of life. It’s received massive investment since it was launched in the 1960s, but the results in terms of child development aren’t always as good as was hoped. What should we be doing to get this right? How do we stimulate infants so that they’re learning to their optimum? We want to replace assumptions about what infants need with scientific evidence.”



12

As an example, he points to language: "It's established that the more you talk to your baby, the better their vocabulary in pre-school; this in turn predicts how well they will learn and perform in exams, and that predicts their job success, so it's incredibly important to be talking to your newborn."

He is new to Trinity, having arrived in May 2017 from the University of Western Ontario in Canada. His teaching commitments won't start until September 2018, giving him time to settle into the Trinity College Institute of Neuroscience (TCIN), which he describes as "a lovely place to work" and to apply for grants, and establish contacts with the Children's Research Centre and with St James's hospital: "My research is very interdisciplinary—I work with neonatologists, psychologists, computer scientists, and bioengineers, while in terms of understanding how the MRI scanner works, there's a physics element."

His own background is suitably multidisciplinary: "After school in the Brecon Beacons in Wales, where I grew up, I read physics and natural sciences in Cambridge, but when it came to doing a PhD I moved into psychology because it's a relatively new discipline—it's an exciting dynamic field where you can make ground-breaking discoveries that change our understanding of the world and of ourselves."

His PhD on the psychology of hearing was in the University of Birmingham and he then returned to Cambridge for fourteen years. "I was doing research into people with brain injuries. This was the period when imaging was really taking off, a tremendously exciting time. Its potential for revealing the algorithms of the brain was just becoming apparent, and this new discipline required both psychology and physics."

From Cambridge, he moved to the University of Western Ontario, and that's where he developed his interest in infant cognition. "It was through serendipity, and meeting the right enthusiastic person, like so many good things in life. I was using imaging with adults. But, about seven years ago, there was a grant call for neuroscience with clinical applications. I had met a neonatologist during my interview process,

and I called him to ask about the potential of scanning for infants. It's a frontier area; I was incredibly excited about the potential to address the question that has probably occurred to almost everyone that has looked in a baby's eyes—what is going on in that tiny mind? And, every advance in knowledge had so many clinical applications. He was enthusiastic and we put together a proposal, which was funded.

"Right now, in terms of technology things are developing so rapidly. We can acquire images of brain function five times faster than we did a few years ago, and we can measure all sorts of things with increasingly fine detail." One of the most exciting potential fields of application is in Artificial Intelligence (AI). "I can remember twenty years ago, people being incredibly excited about AI. But at that time computers couldn't do very much. Now they are starting to do things like humans—for instance they can drive cars and recognise things. So there's renewed belief in how the two field—machine and human intelligence—can learn from each other. And the latest thinking is that machines can learn in the way that babies do. Demis Hassabis, the head of Google DeepMind, has said that he believes that studying cognitive neuroscience is the way forward for bio-inspired artificial intelligence."

Ultimately then, he could be collaborating with industry leaders in AI, as well as with the health sciences and policy-makers in childcare. For the moment, he is establishing his lab and settling into Dublin. "My wife, Dr Lorina Naci, also works in neuroscience, but in ageing and dementia—yes, between us we span the full life-cycle!—she's also found work in Trinity, with the Global Brain Health Institute, which is great. We're loving Dublin as a city, living by the sea, cycling into work. And I've found a squash club, and am working my way up the league."

He's delighted it's such a family-friendly city: "We had a baby three years ago. Yes, my research did shape the way that I interacted with him. It changed the way I was as a parent. I made sure to talk a lot! And it's amazing how much they pick up."



Provost's Council

The Provost's Council was established in September 2016 as a network of leading global Trinity alumni and supporters to act as advisors to the Provost and the College and help shape Trinity's future.

This Council is unique in Trinity's 425-year history – it's the first time that an official external group has been created to help plan Trinity's future direction.

Trinity has always benefitted from the support of alumni and friends. We have 75 alumni branches in 33 countries around the world and the number is always growing. The bond of affection between graduates and the University is truly exceptional. In November 2013, building on this level of goodwill, the College convened the Trinity Global Graduate Forum. Over 200 graduates and friends from very diverse spheres and all leaders in their fields came together. Out of this hugely popular forum, the Provost's Council was born.

There are currently 46 Provost Council members who have achieved exceptionally in their lives and careers and are leaders in finance, manufacturing, retail, investment, property, law, film and new ventures, and are based in Ireland, UK, France, Germany, US, Middle East and Asia. This is a truly global group, of remarkable range and versatility. The Provost, the Board and the whole College have been inspired by their commitment and enthusiasm, their readiness to share their expertise and draw on their networks to help further some of the University's most ambitious ventures. Plans are underway to expand the membership of this group further.

RIGHT – Statue of Edmund Burke

→ The creation of the Provost's Council is a unique, dynamic and inspirational way for Trinity to forge ahead and create opportunities out of the global and national challenges confronting higher education today...



13



Universities in the 21st century

The Provost's Council is a 21st century creation addressing the current needs of higher education. We are in a period of expansion and transformation for higher education globally - the way that countries fund and position their universities is changing, and in Ireland today, as elsewhere in the world, the state alone cannot meet a leading university's needs. Ireland has particular challenges - it boasts the youngest population in Europe and the Department of Education and Skills estimates that the demand for third level places will rise by 25% between 2011 and 2028.

Trinity must draw on its great tradition to make sure that we address these challenges and opportunities with the courage and leadership that we have shown at other crucial junctures through our history.

We need to find innovative solutions if we are to continue to meet our students' needs and to deliver research and scholarship that make a meaningful and lasting impact on society. In Trinity we are proud of our contribution to building Ireland's reputation in creativity, scholarship and entrepreneurship over the centuries, and we are conscious of our responsibility as Ireland's leading university for the world.

The creation of the Provost's Council is a unique, dynamic and inspirational way for Trinity to forge ahead and create opportunities out of the global and national challenges confronting higher education today.

The Philanthropic Campaign

The first Provost's Council met in September 2016. This brainstorming session identified the College's great recent successes in generating non-exchequer revenue from global relations, commercial revenue, industry collaborations, spin-outs and philanthropy. It was agreed that these activities must be accelerated to give the College the revenues it needs to compete globally.

In addition, philanthropy was identified as an area for further growth. Trinity has proven itself as a great research university, a European leader in innovation and entrepreneurship and crucial to Ireland's growth and global standing. A strong sense emerged at this first Provost's Council meeting that to support Trinity was also to support Ireland, and agreement was reached to prepare for the University's first ever Philanthropic Campaign.

At the second Provost's Council in August 2017, invaluable work was done in preparation for the launch of this Campaign in 2019, with focus on the two 'umbrella' areas for which philanthropy is essential: investment in staff and students through a series of transformative professorships and scholarships; and investment in major capital development and research infrastructure projects, including the Trinity St James's Cancer Institute, the Engineering, Energy and Environment Institute (E3), the Trinity Business School, and the Library and its unique holdings.

LEFT (L-R) – Alumni enjoying the new Alumni Room

BELOW LEFT – Alumni Room meeting space

BELOW RIGHT – Oregon Maple, Library Square



The scale of ambition of Trinity's first philanthropic campaign would not be possible without the support, advice and networks of the Provost's Council. Already the benefit deriving from the Provost's Council is tangible, concrete and impactful for the whole Trinity community. This is just the beginning. We look forward to working with the Provost's Council on into the future.

The Provost's Council enables the University to continue to be a leader with a determined vision and is recognition that Trinity belongs not only to current staff and students but to all those who have worked and studied and transformed themselves here, for generations past.

→ **Trinity has proven itself as a great research university, a European leader in innovation and entrepreneurship and crucial to Ireland's growth...**

ALUMNI ROOM

On 10th October 2017 we opened the Alumni Room in the East Chapel. This is a dedicated space on campus for alumni to call home, a place for individuals and alumni groups to meet and relax when they visit Trinity.

The Alumni Room came about thanks to the Provost's Council. It has been generously funded in its entirety by philanthropy. Two Provost's Council members in particular, Fergal Naughton and Alan Dargan, deserve special thanks.

The Alumni Room is recognition of all the great work that alumni do in support of Trinity – through the Trinity Association & Trust, Trinity Women's Graduates, Trinity Business Alumni, the Provost's Council and other groups.

The Room has been renovated and outfitted to the highest possible standards – the furniture is exceptional and the walls are adorned with some of the college's finest paintings. Quite simply, it is one of the most attractive rooms on campus – at once beautiful and cosy and a place you want to spend time in – and for this reason, we know it will be availed of frequently and often by Provost's Council members and all alumni.

It's an exceptional addition to the campus and a very concrete benefit of the work of the Provost's Council.

Trinity's Visitors

Trinity features strongly on all lists of Ireland's Top 10 visitor attractions—no.3 on Trip Advisor and no.5 on Fáilte Ireland—and over two million people visit the University each year.

Welcoming the public

Trinity's iconic campus has plenty to offer the culturally-curious: the Book of Kells and the Long Room, which houses 200,000 of the Library's oldest books together with one of the few remaining copies of the 1916 Proclamation and the Brian Boru Harp. Science Gallery Dublin, the Zoological Museum and student-led walking tours are also key visitor attractions.

There was strong consecutive growth of visitors on campus this year: over 964,000 visitors came to view the Book of Kells from all over the world, with increasing numbers from France, Germany, Ireland, China and the US. Almost 10,000 people visited the Zoological Museum from last June to August to view the unique 200-year-old collection, which includes approximately 25,000 specimens from Ireland and further afield as well as 'live animal' displays.

Since opening in 2008, over three million people have visited Science Gallery Dublin and experienced more than 40 unique exhibitions, ranging from living art experiments to materials science, and from the future of the human race to the future of play.

Through a cutting-edge programme that ignites creativity and discovery, Science Gallery Dublin encourages young people to learn through their interests. In 2016/17, the four shows DESIGN AND VIOLENCE, HUMANS NEED NOT APPLY, SOUND CHECK and IN CASE OF EMERGENCY attracted a record-breaking 436,350 visitors.

RIGHT (L-R) – Provost Dr Patrick Prendergast and Mario Draghi, President of the European Central Bank



→ There was strong consecutive growth of visitors on campus this year: over 964,000 visitors came to view the Book of Kells from all over the world, with increasing numbers from France, Germany, Ireland, China and the US.



14



TOP LEFT (L-R) – Martin Scorsese with Provost Dr Patrick Prendergast and Matthew Nuding, President of The Phil

BELOW LEFT – Nicola Sturgeon, First Minister of Scotland viewing the 1916 Proclamation with Anne-Marie Diffley, Visitor Services Manager, Old Library

→ Since opening in 2008, over three million people have visited Science Gallery Dublin and experienced more than 40 unique exhibitions, ranging from living art experiments to materials science...

This summer visitors to campus enjoyed an enhanced visitor experience with new developments such as the refurbished entrance at Nassau Street, a refreshed Book of Kells exhibition and a brand new visitor centre in Regent House.

A team of student Welcome Ambassadors worked during the peak tourist season, June to October, promoting the venues and facilities open to the public. This summer, for the third year running, they were a real point of difference to visitors who love hearing insider knowledge on Trinity student life.

Welcoming dignitaries

To mark the 425th anniversary of the founding of the University, a symposium on 'Trinity through the Centuries' was held in September 2017. The opening address was given by An Taoiseach, Leo Varadkar TD, who earned the distinction this year of being the first Trinity graduate to hold the office of Taoiseach.

The President of the European Central Bank, Mr Mario Draghi gave a keynote address at Trinity on 'Youth unemployment in the euro area' at the School of Social Sciences and Philosophy's annual Henry Grattan Lecture in September. It was followed by a roundtable discussion – the ECB Youth Dialogue – when he was joined by Trinity Economics students. The visit concluded with Mr Draghi being presented with the Gold Medal of Honorary Patronage by the University Philosophical Society (The Phil).

The First Minister of Scotland, Nicola Sturgeon, was another recipient of The Phil's Gold Medal in November 2016, while a few months later renowned film director, Martin Scorsese also became an honorary patron when he visited Trinity in February. Both addressed packed audiences of students and staff.

In January Nobel Peace Prize winner F.W. de Klerk was presented with the Trinity College Law Society *Praeses Elit* Award in recognition of his key role in ending apartheid and his outstanding contribution to reconciliation in South Africa.

The 47th US Vice President Joe Biden returned to Trinity for a visit in September with his family. In June of last

year he was awarded an honorary doctorate from the University.

His Excellency Governor General of Australia, Sir Peter Cosgrove announced a €200,000 scholarship fund for Australian students to study on the Trinity MBA during his visit in September.

The Minister of Environment and Climate Change for Canada, Catherine McKenna, MP engaged in a student debate and Q&A session in October, focusing on Canada's leadership on climate change, encouraging youth involvement, the role of women, and the role of innovation in transitioning to lower-carbon economies. She was joined by former President of Ireland and Chancellor of Trinity, Dr Mary Robinson, who is President of the Mary Robinson Foundation – Climate Justice.

Other dignitary visits throughout the year included H.E. Mr Ji Bingxuan, Vice-Chairman of the Standing Committee of NPC, Mr Fumio Kishida, Minister of Foreign Affairs, Japan, Mr Igor Crnadak, Minister of Foreign Affairs, Bosnia-Herzegovina, Ms Margrethe Vestager, EU Commissioner for Competition, Sheikh Abdullah bin Zayed Al Nahyan, Minister of Foreign Affairs and International Cooperation of UAE, Mr Jean-Marc Ayrault, Minister of Foreign Affairs and International Development, France, Professor Norbert Lammert, President of the German Bundestag, Mr Eiki Nestor, President of the Estonian Parliament, Mr Michel Sapin, Minister for the Economy and Finance, France, Mr Zeid Ra'ad al Hussein, UN High Commissioner of Human Rights and Mr Hu Chunhua, Secretary General of the Chinese Communist Party, Guangdong province.

Vice-Chancellor of Oxford University, Louise Richardson, film maker, David Puttnam, founder of Jones Engineering, Eric Kinsella and former Chief Nursing Officer with the Department of Health, Peta Taaffe, were awarded honorary doctorates at Trinity's winter commencements.

At the summer commencements in June 2017, rock star and humanitarian activist Bob Geldof, historian Professor Marianne Elliott, Australian medical researcher, Professor Terence Dwyer, scientist Professor James P Smith, and environmentalist Patricia Oliver received honorary degrees.

Governance

Trinity College Dublin is committed to maintaining high standards of corporate governance and has put in place the appropriate governance structures consistent with such objectives.

The University has adopted the Trinity College Dublin Code of Governance 2013 (www.tcd.ie/about/content/pdf/TCD_Code_of_Governance_2013.pdf) which is based on the Code of Governance for Irish Universities 2012, as agreed between the Higher Education Authority (HEA) and the Irish Universities Association.

Establishment

Trinity College Dublin was founded in 1592 by the Royal Charter of Queen Elizabeth I and is recognised by the Government of the Republic of Ireland, through its designation under the Higher Education Authority Act, 1971, the Universities Act, 1997 and the Trinity College, Dublin (Charters and Letters Patent Amendment) Act, 2000.

Provost

The Provost is the Chief Officer of the University and a member of the Body Corporate. The role of the Provost is defined in the relevant legislation and in the Statutes (www.tcd.ie/registrars/statutes) and the Provost is appointed after an election by academic staff and student representatives for a ten year term.

→ Trinity College Dublin was founded in 1592 by the Royal Charter of Queen Elizabeth I and is recognised by the Government of the Republic of Ireland.



15

→ The total number of Board meetings held during the year was 11.

Board

The Board is the governing authority of Trinity College Dublin, the University of Dublin. The Chairperson of Board is the Provost. Information on Board meetings, Agendas, Minutes, scheduled meetings and membership can be found on the Board website (www.tcd.ie/committeepapers/board/papers).

University Council

The University Council is the academic council of the University, and subject to financial constraints, is responsible for College's academic affairs including curriculum development and academic appointments.

Information on Council meetings, Agendas, Minutes, scheduled meetings and membership can be found on the Council website (www.tcd.ie/committeepapers/council/papers).

Major decisions of Board in 2016/17:

Research and Education:

- Trinity is now a member of the League of European Research Universities (LERU);
- Trinity Education Project (TEP) progressing with the approval of a new academic year structure;
- Standardisation of progression and awards under TEP;
- Review of Two-Subject Moderatorship.

Campus development:

- The construction of the Trinity Business School is progressing well and the building is on schedule to be completed at the end of 2018;

- The demolition of Oisín House, which will deliver 250 new units of student accommodation, is now complete and the Printing House extension has been removed. Construction of the new accommodation has commenced on site;
- Progression of the E3 project underway with a proposal to establish a teaching institute, the E3 Learning Foundry, at the east end of College;
- Estates and Infrastructure Masterplan being progressed by the Bursar;
- With respect to the Trinity St James's Cancer Institute, a Cancer Institute Development Group has been appointed.

Governance:

- Redesign of management structures to focus on the Strategic Plan goals and increase the speed of decision-making;
- Establishment of the Remuneration Committee, a compliance committee of the Board;
- Establishment of the Provost's Advisory Committee on Sustainability;
- Introduction of the Policy and Procedure on Engaging Externally Contracted Service Providers;
- On-going oversight of the activity of Trinity's subsidiaries.

Board Meetings

The total number of Board meetings held during the year was 11.

BOARD MEMBER

ATTENDANCE

EX OFFICIO		ELIGIBLE TO ATTEND	NO. TO ATTEND
P.J. PRENDERGAST	PROVOST	11	11
C. MORASH	VICE-PROVOST/CHIEF ACADEMIC OFFICER	11	10
G.S. MARTIN	SENIOR LECTURER/DEAN OF UNDERGRADUATE STUDIES	11	11
P. MURPHY	REGISTRAR	11	11
V.A. CAMPBELL	BURSAR/DIRECTOR OF STRATEGIC INNOVATION	11	11
ELECTED/NOMINATED			
D. AHERN	FELLOWS AND FELLOW PROFESSORS	11	10
S. ALYN STACEY	FELLOWS AND FELLOW PROFESSORS	11	10
O. BRAIDEN	EXTERNAL MEMBER	11	10
S. COLLINS	STUDENT REPRESENTATIVE (PRESIDENT OF GRADUATE STUDENTS' UNION)	11	11
S.M. DRAPER	FELLOWS AND FELLOW PROFESSORS	11	9
S. DUNPHY	TECHNICAL, ADMINISTRATIVE AND SUPPORT STAFF	11	10
S. FARRELL	TECHNICAL, ADMINISTRATIVE AND SUPPORT STAFF	11	9
D. FAYNE	NON-FELLOW ACADEMIC STAFF	11	10
R. GILLIGAN	FELLOWS AND FELLOW PROFESSORS	11	9
J. KEOGH	TECHNICAL, ADMINISTRATIVE AND SUPPORT STAFF	11	9
T. KEOHANE	EXTERNAL MEMBER	11	6
C. LAUDET	NON-FELLOW ACADEMIC STAFF	11	10
B. M. LUCEY	FELLOWS AND FELLOW PROFESSORS	11	9
C. MCCABE	NON-FELLOW ACADEMIC STAFF	11	10
K. MCNULTY	STUDENT REPRESENTATIVE (PRESIDENT OF THE STUDENTS' UNION)	11	11
R. MOSS	NON-FELLOW ACADEMIC STAFF	11	10
A. NÍ LOCHLAINN	STUDENT REPRESENTATIVE (WELFARE OFFICER OF THE STUDENT'S UNION)	11	9
E. O'HALPIN	FELLOWS AND FELLOW PROFESSORS	11	11
D. R. PHELAN	FELLOWS AND FELLOW PROFESSORS	11	10
A. SEERY	NON-FELLOW ACADEMIC STAFF	11	10
R. TIMONEY	FELLOWS AND FELLOW PROFESSORS	11	11
D. WHELEHAN	STUDENT REPRESENTATIVE (EDUCATION OFFICER OF THE STUDENTS' UNION)	11	8
IN ATTENDANCE			
I. MATHEWS	TREASURER/CHIEF FINANCIAL OFFICER (IN ATTENDANCE <i>EX OFFICIO</i>)	11	10
J. COMAN	SECRETARY TO THE COLLEGE (IN ATTENDANCE <i>EX OFFICIO</i>)	11	11
G. RUANE	CHIEF OPERATING OFFICER (IN ATTENDANCE, BY INVITATION)	11	11
J. HUSSEY	VICE-PRESIDENT FOR GLOBAL RELATIONS (IN ATTENDANCE, BY INVITATION)	11	10
V. BUTLER	ASSISTANT SECRETARY TO THE COLLEGE (IN ATTENDANCE)	11	11
S. KAVANAGH	ASSISTANT SECRETARY (ACTING) (IN ATTENDANCE)	1	1

Financial Elements 2016–17

While overall funding for core activities from Exchequer sources appears to have stabilised, this is against a backdrop of significant cumulative core grant reductions (overall State funding per student has declined by c.20% between 2008 and 2016) and year-on-year increases in student numbers resulting in a shift in the balance of public and private funding. In the context of reduced public funding, the University continues to focus on key areas of non-Exchequer income generation (post-graduate and international students, commercialisation, philanthropy, research and industry engagement) to diversify and grow the University's income streams, and in doing so, secure our financial sustainability.

The University is committed to addressing its challenging financial position as a matter of priority with the majority of the reported deficits linked to the provision for infrastructure, a real cost which, to date, has not been adequately funded from public funding sources.

Under FRS 102 GAAP accounting, at this time Trinity is projecting a financial deficit of c.€17.5m for the financial year 2016-17.¹

In line with the requirements of Section 37 of the Universities Act 1997, and similar to last year, the University notified the HEA in July 2017 that expenditure will exceed income in 2016/17. Trinity has a financial plan to eliminate the deficit however, after allowing for an ongoing provision for depreciation, it is anticipated that the University will report reducing deficits in the coming years.

On the issue of overall financial sustainability, the University is aiming to report an annual surplus of at least 3% of income (OECD recommendation). To achieve this target in the medium term, the University must now increase its revenue even further and improve the return on existing activities as any further cost reductions could have a significant negative impact on quality of teaching, rankings and the overall student experience. The financial situation of the University continues to need careful management going forward and in that context a number of meetings were held with the HEA in 2017 to seek their input and support in addressing the challenging fiscal environment.

Funding for the Irish HE sector has been considered extensively by the Cassells Report. The University fully endorses the findings and recommendations of this Report and a long-term funding plan now needs to be established at a level sufficient to ensure Trinity's financial sustainability including capital infrastructure renewal, development and upkeep.

¹ Financial year 2016-17 final figures will be available in Q4 2017.

16 Summary Financial Position 2012–16

The Consolidated Financial Statements for the year ended 30 September 2016 were approved by the Board in March 2017 and the summary financial position is set out below.

	2016	2015	2014	2013	2012
	€m	€m	€m	€m	€m
State grants	44.0	44.5	47.3	54.5	58.7
Academic fees	133.7	128.9	122.2	116.1	113.8
— EU UG	71.3	71.3	70.6	68.7	68.4
— EU PG	23.5	23.1	22.1	23.1	23.0
— Non EU UG	25.0	22.7	21.0	17.1	16.1
— Non EU PG	9.2	7.4	6.7	6.1	5.2
— Other	4.7	4.4	1.8	1.1	1.1
Research grants and contracts	92.2	85.2	78.0	74.7	75.9
CRU Income	40.6	34.4	29.8	27.9	27.1
Other income	10.0	10.1	21.4	22.6	22.4
Investment income	6.8	7.0	7.0	6.5	6.6
Donations and endowments	11.7	12.9	–	–	–
Income (excluding grant amortisation)	339.0	323.0	305.7	302.3	304.5
Staff costs	234.7	231.1	225.7	221.8	220.9
Other operating expenses	95.9	94.5	89.4	85.0	84.9
Total operating expenses	330.6	325.6	315.1	306.8	305.8
Operating (deficit)/surplus before interest costs and net depreciation	8.4	(2.6)	(9.4)	(4.5)	(1.3)
Less:					
Depreciation (net of grant amortisation)	(34.4)	(19.8)	(17.0)	(14.0)	(12.0)
Net Interest payable	(4.6)	(3.6)	(3.4)	(1.4)	(0.3)
Deficit before other gains and losses	(30.6)	(26.0)	(29.8)	(19.9)	(13.6)
Plus:					
Gain/(loss) on revaluation of investment property	11.6	9.9	7.9	(2.6)	(7.5)
Gain on investments	9.6	2.1	–	–	–
Deficit for the year	(9.4)	(14.0)	(21.9)	(22.5)	(21.1)

2015-16 Financial Year

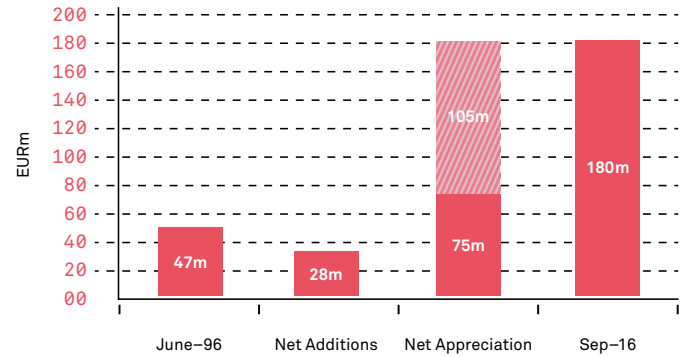
BELOW – Growth in Trinity
Endowment Funds 1996–2016

A combination of strong student recruitment, increasing research activity and significant profits generated by the Commercial Revenue Unit (CRU) helped to deliver consolidated income, excluding grant amortisation, for 2015/16 of €339m (2014/15: €323m), which represents an increase of 4.7% on the prior year. Consolidated expenditure, excluding depreciation and interest payable, for the year amounted to €330.6m (2014/15: €325.6m).

Consistent with our plans, the Consolidated Financial Statements for 2016/17 report an EBITDA (earnings before interest, tax, depreciation and amortisation of State grant) deficit before net depreciation and interest costs of €8.4m. The deficit of €9.4m includes the University's provision for infrastructure renewal by way of a net depreciation charge of €34.4m, incorporating a one-off impairment charge of €16.7m relating to the demolition of Luce Hall and the vacating of Oisín House to make way for the development of the Business School and new student accommodation.

The consolidated net assets amount to €805.1m at 30 September 2016, a decrease of €9.5m over 2014/15 (as restated). The new accounting treatment under FRS 102 has resulted in a material downward adjustment to net assets of €267.7m due to the reclassification of deferred capital grants to deferred income in creditors greater than one year, with effect from the FRS 102 transition date of 1 October 2014. As part of the transition to FRS 102 the University also undertook an external professional revaluation of its land, partially offsetting these adjustments by increasing the value of our land assets by €180.6m.

The Endowment Fund net assets were €180m at 30 September 2016 thereby achieving the target value for the Endowment Fund as set out in the University's FY2014–2019 Strategic Plan. The market value of the Fund has increased over the last 10 years with total cumulative returns for the last 1, 3 and 10 years of 10%, 33.4% and 52.8% respectively. An additional €2.8m in donations was added to the Endowment Fund in the FY2015/16 financial period. During the year to 30 September 2016 the gross income was €6.5m (30 September 2015: €6.6m) enabling the University to maintain the quality and integrity of academic programmes and underpinning the University's investment in IT Transformation Strategy initiatives. During 2015/16, the Investment Committee considered the issue of fossil fuel divestment that has gained considerable momentum both nationally and internationally and also within the University itself. Following consultation with Student Union representatives and Fossil Free TCD, the University's divestment from fossil fuels was finalised in November 2017.



In 2015/16, thanks to the support of alumni and friends, Trinity Development & Alumni (TDA) successfully secured pledges in excess of €73m and received a total of €12m in project funds. €17.4m was transferred to the University in the year to support academic posts, student access, scholarships, research and capital infrastructure.

The level of research activity for 2015/16 recorded in the Consolidated Financial Statements (measured on the basis of research expenditure during the year and not income received) amounted to €92.2m an increase of 8.2% (2014/15: €85.2m). This is the third consecutive year that the University has recorded an increase in research income with the current year 23.5% ahead of 2012/13. The value of new awards secured in the year amounted to €164m, an increase of 56% on the prior year (2014/15: €105m). This total includes a €68m award from Atlantic Philanthropies to fund the Global Brain Health Institute. This landmark award is the biggest philanthropic award in Irish history and the largest single award ever pledged to the University.

While the research environment remains very competitive, current projections for research income are greater than €90m per year over the next 5 years. The University continues to benefit from the success of the Research Diversification Strategy, which focuses on EU, Industry and other non-Exchequer funding. The relatively low recovery rate of indirect costs compared to the Full Economic Cost (FEC) rate remains a cause for concern with the indirect cost rate recovered on direct expenditure also decreasing to 18% in the year (2014/15: 20%). This funding gap will need to be addressed if the University is to continue growing and supporting research effectively.

DR. PATRICK PRENDERGAST
PROVOST

IAN MATHEWS
CHIEF FINANCIAL OFFICER

OFFICE OF THE PROVOST

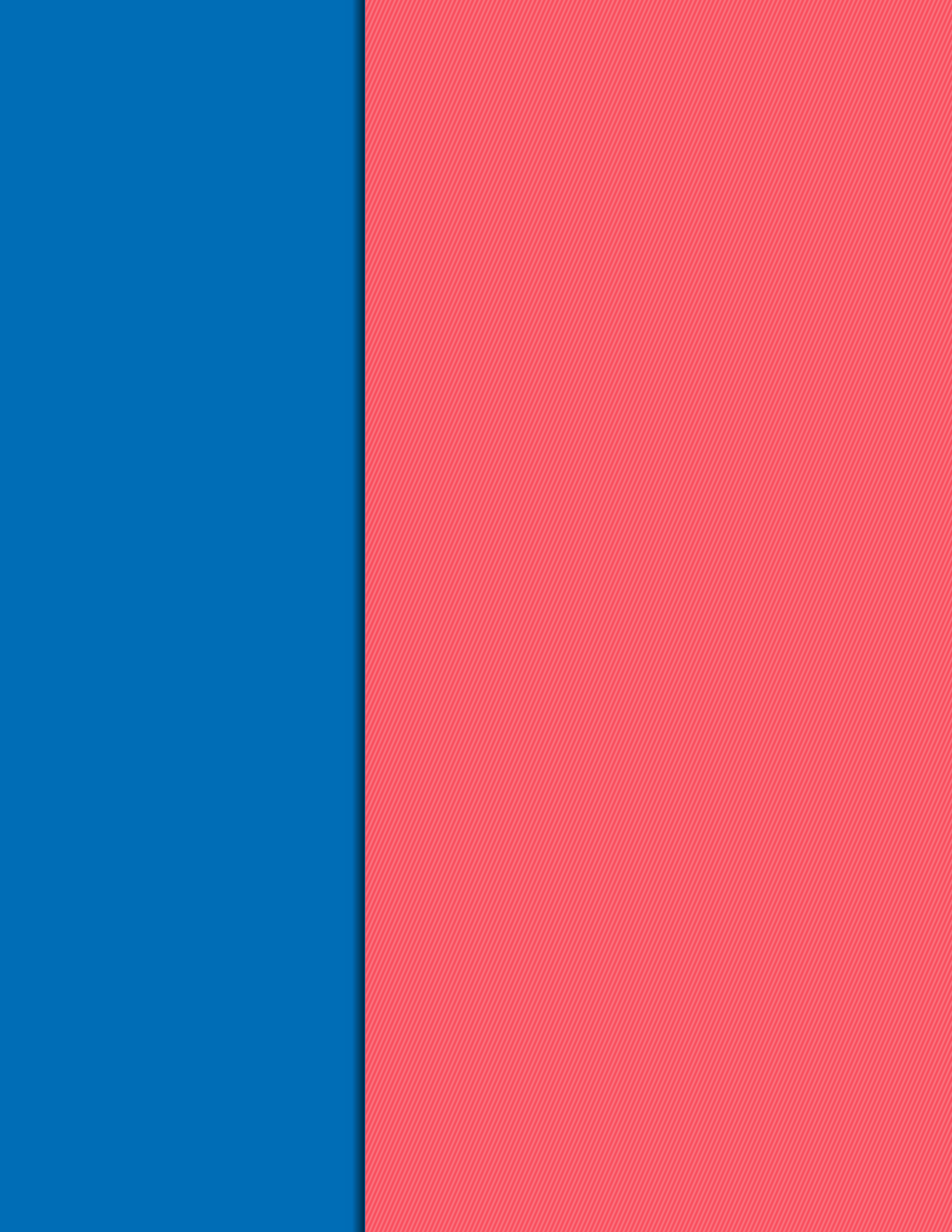
House 1, Trinity College Dublin
Dublin 2, Ireland

–

T + 353 1 896 4362

E provost@tcd.ie

W www.tcd.ie



TRINITY COLLEGE DUBLIN

A 425 year old University in the
heart of Dublin City Centre
